FLIGHT
and
The AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

8-10, CORPORATION ST., COVENTRY. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.
GUILDHALL BUILDINGS, NAVIGATION ST., BIRMINGHAM, 2. Telegrams: Autopress, Birmingham. Telephone: Midland 2971 (5 lines).
260, DEANSGATE, MANCHESTER, 3. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.
26B, RENFIELD ST., GLASGOW, C.2. Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

SUBSCRIPTION RATES: Home and Abroad: Year, £2 8 0. 6 months, £1 4 0. 3 months, 12s. 0d.
Registered at the G.P.O. as a Newspaper.

No. 1675. Vol. XXXIX. JANUARY 30th, 1941. Thursdays, Price 9d.

The Outlook

P. B. Defence

"THOSE people who can take comfort from the mere noise of the guns are confusing defiance with defence." In that sentence is summed up Mr. Noel Pemberton-Billing's attitude towards the present measures against the night bomber, and the sentence constitutes, in fact, the *raison d'être* of his book, published last Monday, and entitled "Defence Against the Night Bomber." P. B. is careful to point out in his foreword that although the book deals with defence, the only true defence is offence, and it is in connection with the latter that he proposes to use the "slip-wing" bomber which he described in *Flight* in recent articles. Other chapters in the book have also been published by us, so that readers will know approximately what to expect. There are, however, a great many other aspects of air defence and attack, and they are treated in P. B.'s inimitable style, not the least attractive aspect of which is the abandon with which he splits Cabinet Ministers, Governments and infinitives with great impartiality.

Briefly summed up, P. B.'s argument is that searchlights and anti-aircraft guns are of little use, being more of a nuisance to ourselves than to the enemy; that the black-out is a waste of time and causes casualties, irritation and delays; that camouflage by bright lights would enable us to disguise not only our cities and aerodromes but even our coastline; that the only real defence against the night bomber is the night fighter; and that all true defence must be offence.

The "Towfit"

FROM extracts of chapters published in this journal our readers will already be familiar with the Pemberton-Billing slip-wing fighter and slip-wing bomber. In Chapter vii. of the book he outlines a scheme for yet another method of giving the high-speed manœuvrable fighter the duration necessary for standing patrols at night. Instead of the vertical and rigid attachment of the two aircraft of the slip-wing and Mayo Composite combinations, he proposes a horizontal and non-rigid attachment, i.e., what he terms the tow fighter. The idea is that a large twin-engined aircraft (an outmoded bomber will do) should tow the fighter along at fairly low speed, the fighter's engine being merely kept windmilling to keep it warm. Thus the fighter will be at its operational altitude at all times, and will be ready to cast off instantly and go into action as a fighter, the bomber assisting by dropping parachute flares to show up the enemy bomber.

The idea was inspired, and the author admits it frankly, by the towing of gliders. What P.B. has done is to substitute a fighter (or even a train of fighters) for the glider. The method of "hooking-on" is somewhat vaguely outlined, but seems feasible enough. The main drawback is that the system presupposes either a twin-engined fighter or a single-engined pusher fighter, as the airscrew of the single-engined tractor would get in the way. The latter alternative seems to be preferable, as the twin-engined fighter would have to have a very long nose in order to reduce the risk of the cable fouling one of its airscrews.

For sheer simplicity the tow fighter (it will probably come to be known as the "Towfit," just as the old Bristol Fighter became the "Brisfit") appears preferable to the slip-wing. The towing aircraft can be almost any obsolescent type, and the fighter will not need the specially-strengthened undercarriage which was required in the slip-wing combination. The hooking-on operation will be delicate, as anyone knows who has taken part in one of Sir Alan Cobham's refuelling operations, but usually the air is fairly steady at night. And anyway the take-off could be timed to take place at dusk. (P.B. outlines an arrangement whereby the trailing line is held taut by a pair of drogues.)

A "Pep Pool"

IN his lecture to the Royal Society of Arts last week Sir Alan Cobham dealt with technical and commercial aspects of his system of refuelling in flight. He was careful to point out that, although circumstances made it impossible for him to refer in detail to the military applications, these were obvious.

There is at least one feature in which Mr. Pemberton-Billing's "Towfit" and Sir Alan's flight refuelling system share a common risk: the two aircraft have to make contact. It is not, of course, suggested that the towed fighter scheme is suitable for flight refuelling, since the duration of the fighter is short, and it is in any case desired to keep it ready with full tanks, but many other military applications come readily to mind in which the two systems have many points in common.

We are not overlooking the fact that P. B.'s method of "hooking-on" and that employed by Sir Alan Cobham differ not only in detail but in principle. Nevertheless, the two systems have many problems which are similar if not quite identical. Sir Alan has had long practical experience, while P. B. (we say it without any intention of giving offence) is theorising.

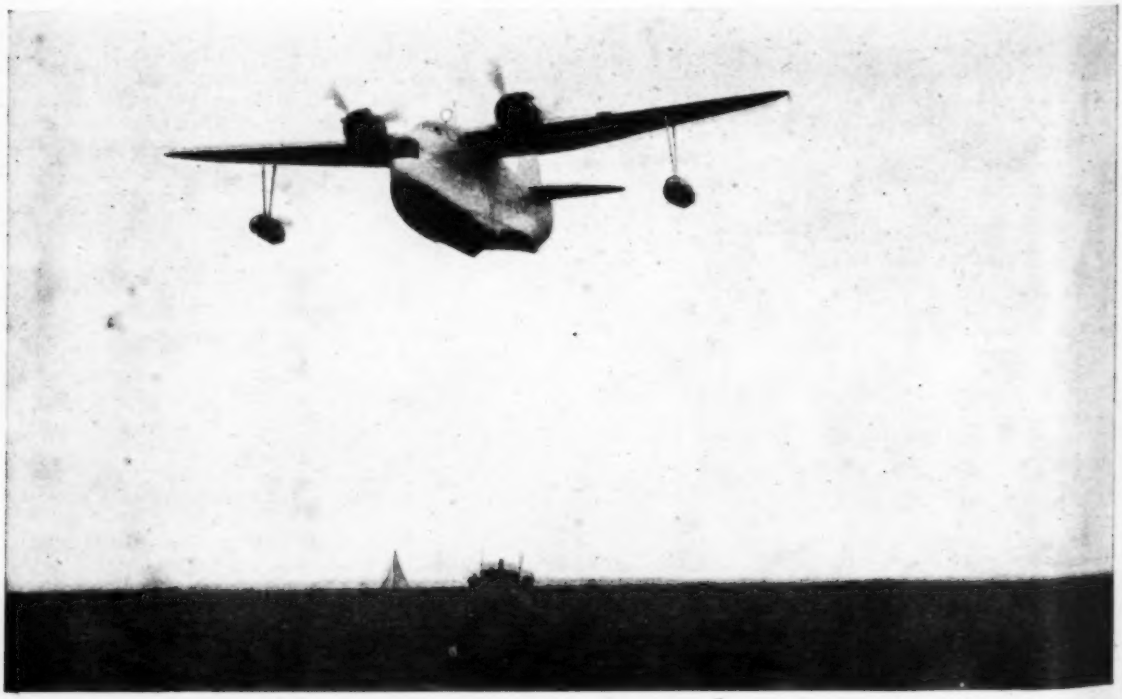
In normal times one would hesitate to suggest a pooling of ideas and experience, but these are not normal times, and consequently we risk incurring the wrath of all concerned by suggesting that the Air Ministry should set up a special small committee to thrash out the complicated problem of assisted take-off in all its aspects. Sir Alan Cobham and Major Mayo (with Short Brothers) have both had practical and successful experience. Mr. Pemberton-Billing has many new ideas, not all of which have been published. There are other designers and inventors with schemes of their own, not forgetting the catapult experts.

That heavily loaded long-range aircraft types will have to be adopted is certain, so why not get together all the accumulated experience that exists? After all, aircraft constructors have pooled their data and experience for the common good. So why not an assisted take-off committee, or what one might call a "Pep Pool"?

Lysanders at Tobruk

SINCE the beginning of the war the great deeds of the Coastal Command, the Fighter Command, and the Bomber Command have been brought to the notice of the British public, while the Fleet Air Arm has won one of the greatest victories of the war. One branch of warlike air activity has not been much in the news until the other day, namely, the work of the Army co-operation squadrons. In the operations in France the squadrons of Westland Lysanders probably did more than was ever brought to public notice, though in that campaign their activities may well have been circumscribed by the shortage of protecting fighters. But in the storm of Tobruk the Lysanders have certainly got into the news. Their daring work attracted the attention of the correspondents who watched the fighting, and has been mentioned with a good deal of emphasis both in influential daily papers and in a B.B.C. broadcast.

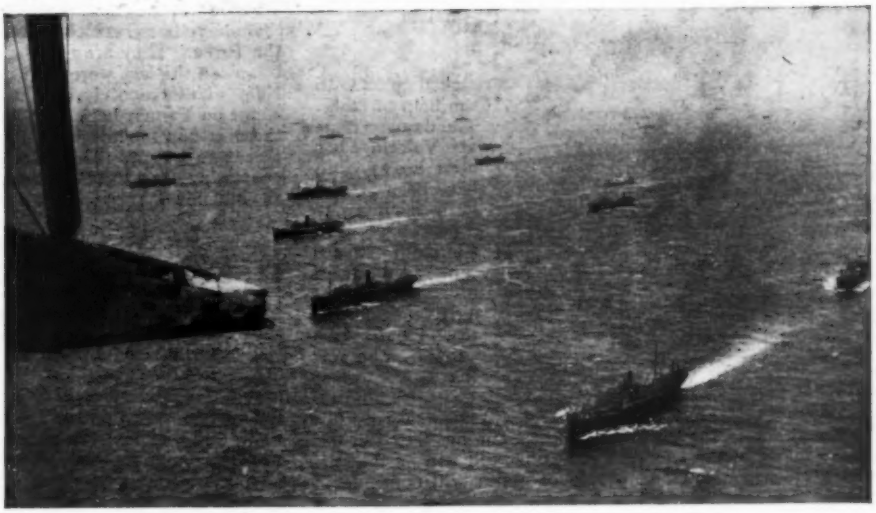
When the artillery gets to work on the defences of a place which the Army is attacking, there is no longer any need for the intervention of bomber aircraft. The field guns and howitzers are the proper weapons for clearing the path for the tanks and the infantry, but the gunners must be told whether their shells are falling on the target on not. It is the duty of the Lysanders to give them this information. At Tobruk the Italian anti-aircraft guns were well manned and made the task of the Lysanders as difficult and dangerous as possible. One observer-pilot is said to have reported curtly that the "A.A. is damnable." None the less the pilots went into it and kept at their job until the British guns had silenced the opposition, with a gallantry which aroused the great admiration of all beholders. As a result the British losses in the assault were less than 500 men. Well done, Lysanders!



HERCULEAN POWER: The Saro Lerwick with its two 1,300 h.p. Bristol Hercules engines is the fastest flying boat in service with the Coastal Command.

War in the Air

Fall of Tobruk : R.A.F. Supreme : Gallant Lysanders



MERCHANT MARINE : A large convoy of supply ships escorted by a Short Sunderland which must look out for enemy aircraft and feathers from submarine periscopes.

TOBRUK has fallen, as had been expected. With its capture the best harbour on the Libyan coast east of Benghazi is now in British hands, and that is a great advantage. Another large section of Marshal Graziani's Army has been lost to the cause of *Fascismo*. Why that Marshal, who once had the reputation of being a capable soldier, should have allowed the British to overwhelm in detail two large Italian forces is a mystery. It would surely have paid him better to have abandoned both Bardia and Tobruk and concentrated their garrisons at Benghazi, or wherever he intends to make his real stand. But each garrison in turn was left to its fate, and the British were given time to bring up artillery and other necessaries almost at their leisure, and to invest the places so thoroughly and to beat down the defences so effectively that the final assault was the reverse of a costly operation.

The honours of the defence, it appears, go to the Italian anti-aircraft gunners. The *Regia Aeronautica* has been out of the Libyan picture for some time past, and the R.A.F. has undisputed mastery of the North African skies. The British fighters have ranged all over the desert without meeting with any opposition, and could only fire their guns at ground targets. The bombers repeated at Tobruk the hammering tactics which they had employed at Bardia. But when the final assault was launched, it was the duty of the artillery to smash up the nests of machine guns which might have inflicted heavy losses on the Australians and other British troops. The cautious (caution and dash are not mutually opposed qualities) commanders on the spot had no intention of wasting British lives by hurling infantry against active machine guns. That was where the Lysanders came into their own. It was their job to spot the pill-boxes and direct the fire of the guns on to them. But in places the anti-aircraft guns of the Italians were so carefully concealed and so gallantly manned that the task of the observers in the air was not easy. One message from a Lysander (so the special correspondent of *The Times* reports) curtly remarked, "Anti-aircraft fire damnable." None the less, the job was finished in good time, and the infantry secured the position without heavy losses.

Three as One

THESE recent brilliant successes in Libya have been, above everything, examples of all three Services working together in perfect unison. The Army has struck the final blow, which was according to the book, but both Navy and Air Force have played their parts to perfection. Had either of them been found wanting in any degree of co-operation, the Army would have suffered more than it did. But in the way all three worked together they might all have been one unit under one supreme commander. Things have not always worked so well in past operations. In other wars there have, unfortunately, been instances of inter-Service misunderstandings, or worse, and not only in British wars. But in the Middle East it seems that Admiral Cunningham, General Wavell and Air Chief Marshal Longmore are a team which pulls together in ideal fashion, each highly competent in his own line, and each full out to help the others without thoughts of seeking special credit for himself or his own Service. No one can justly say that the victory was all due to the brilliance of the ground operations, or to the command of the sea, or to the very complete mastery won in the air. Each of those three elements was necessary to make the perfect victory, and as each was forthcoming this Libyan campaign will go down in military history as a copybook example of how victory can best be won.

In Albania the Greek communiqués are very reticent, though military spokesmen say that the modestly reported advances which the Army has made, in spite of the appalling weather, have had great strategical value. The weather has not prevented the R.A.F. from keeping up its blows on the Italians. Valona has been raided several times, and the intensity of the attacks has been increased. Brindisi has also been visited, and likewise the Italian Army base of Elbasan. The Italian Air Force has lately resumed its raids on Greek towns, and Salonika, Volos, Previza and an Ægean island (not named in the communiqué) have suffered. Whether this resumption of activity is due to the arrival of German air contingents is not certain. These particular raids seem to have been made by Italians, but the arrival of Germans may have spurred them into renewed activity.

The German aircraft seem to be gathered mostly in Sicily, which has accordingly been bombed again several times by the R.A.F., with consequent damage to more enemy aircraft on the ground. The Germans have been concentrating their attention on Malta, and a story has reached New York that some of their pilots have boasted that they would take Malta in a fortnight. They admitted heavy losses, and said that their two best dive-bombing pilots had been killed. This goes to confirm the supposition mentioned in *Flight* last week that the Germans had sent

WAR IN THE AIR (Continued)

SOUVENIRS : An R.A.F. pilot with sundry odds and ends collected in and around Bardia.

picked pilots to the help of Italy. The damage done at Valetta has been heavy, and has been borne with such courage that Mr. Churchill has sent a telegram of congratulation and encouragement to the people. The acting Governor of the island replied, saying, "By God's help Malta will not weaken." In a broadcast to the people he said, "The heaviest toll has been taken of the enemy. A heavier toll will be taken if he attacks again. The people of Malta will continue to show the same spirit which has won the admiration of the world in past months."

The German Intervention

WHEN one bears in mind the success which has attended the co-operation of all three Services in the campaign in Libya, one cannot believe that the general position in the Mediterranean can be much altered by the help which Germany has so far sent to Italy, as that help has consisted, at first at least, of only one arm, the air arm. That by itself could not reverse the present position. The British and Greeks are in the ascendant on all three elements, and, even if the R.A.F. have now to fight harder to hold the mastery of the air, that will not convert Graziani into the conqueror of Egypt or give the shattered Italian Navy command of the sea. It could not drive the Greek troops back through Albania. The German High Command has learnt from its experiences round about the English Channel that a superiority of aircraft does not spell victory. So it is not surprising to hear that the German Army is massing in the direction of the Balkans, and that strong pressure is being put upon Bulgaria and Yugoslavia. It is highly improbable that the Germans will repeat the mistake which Mussolini made and start a Balkan campaign while winter conditions prevail; but the spring is drawing near, and then there may be developments. There is, of course, the possibility that the Germans are feinting at the Balkans in order to draw more British forces there and so, they will hope, weaken the defences of Great Britain. On the other hand, the threats put about that Great Britain is soon to be invaded may be intended to keep forces in the North which might otherwise be sent to the Middle East. Hitler wants to keep us guessing. He is working on interior lines, and can move troops easily (or as easily as the not very good railway services permit) from the Channel to the Balkans or in the other direction. But he is known to have a strong aversion to fighting on two fronts at the same time.

We British also have to fight on two fronts, or at least to be ready to do so; but our command of the seas makes it possible for us to move our forces from one front to another, though more slowly. When we are a fully armed nation, this command of the seas will give us the initiative and allow us to choose the most favourable spot for assuming the offensive. We have a great asset in our Prime Minister, one who has deeply studied strategy, and who, as Minister of Defence, will make it certain that the efforts of our Services are co-ordinated and not dispersed. Twenty odd years ago he was himself involved in such a dispersal of effort, the Navy running one campaign while the Army ran another; but he is now in a position to see that that sort of thing does not happen again.

In view of the German threat to Yugoslavia and Bulgaria, there have been staff conversations between the British and the Turks. They are not the first which have taken place, but since the last were held much water has run down the Nile. Unfortunately, we and the Turks can no longer count on French help from Syria; but, on the other hand, there is now no need for the staffs to discuss an Italian threat to Egypt. There should be stirring happenings in the spring, but the Germans are still a long way off from the oilfields of Iran and Iraq.

Raids on German Territory

IT would be premature to assert that regular raiding by day of objectives in territory occupied by the enemy has become a standard policy of the R.A.F., but occasional surprise sorties by either fighters or bombers, or both, give chances to do useful damage. On January 22 fighter pilots of the R.A.F. carried out an offensive sweep over enemy-occupied aerodromes in Northern France, attacking and damaging aircraft on the ground, scattering convoys on the roads and machine-gunning troops engaged on construction work. Six pilots, all Poles from a famous Hurricane squadron, took part in the raid. Twice they left their base during the afternoon to carry out attacks, and on each occasion they returned to report success. On the first trip one of the pilots began the offensive by diving and firing at a number of small motor boats he met off the French coast while on the way to Le Touquet aerodrome, where he saw five Messerschmitt 109s on the ground, and machine-gunned them. On his way back he met anti-aircraft fire, and stopped long enough to send all his remaining ammunition spattering among the guns' crews.

When the pilots went out the second time, the six split up into pairs. The first pair hid in the clouds for some minutes until they were well over the French coast, when the pilots dived down on to an aerodrome in course of construction about twenty miles inland. As they opened

A FIAT HAD BEEN ISSUED : The remains of an Italian C.R. 42 fighter left derelict on the Western Desert.

WAR IN THE AIR (Continued)

fire, men in the uniform of the German Air Force came running from huts and lay down wherever they could find cover in the field, while others dropped their tools and scattered headlong. The second pair, also diving down through a gap in the clouds, this time a few miles inland from Boulogne, found a convoy of thirty military lorries on a road. They zigzagged above, firing bursts at the drivers, many of whom stopped their vehicles and jumped for cover. Troops also jumped from the lorries to lie down in ditches. The third pair flew to Montreuil, where they found a convoy of lorries and a petrol tanker which they shot up on a road. After this, they became separated in cloud, and one pilot returned to England, but the other saw two Messerschmitt 109s on the ground with their engines running and moving into position to take off. He attacked them, and one overturned on its side. He then saw four more Messerschmitt 109s hidden under trees on the edge of the aerodrome. He dived, firing a long burst, and smoke was seen to envelop one of them.

Later News

THE speed of General Wavell's movements almost takes one's breath away. Hardly had Tobruk been occupied when British troops began to make themselves felt at Derna, the next point along the Libyan coast. The R.A.F. have been bombing the aerodrome there for some time past, and they increased their raids as the advanced troops began to engage the defences.

Meantime the Army of the Nile is advancing in East Africa. The Italians are being driven out of Kenya, and Eritrea and Italian Somaliland have been invaded. The South African and Rhodesian squadrons are particularly active in those parts. The rising of patriots in Abyssinia is gaining momentum now that the Emperor Haile Selassie has returned to his country.

The aerodromes in Sicily, where the bulk of the German air contingent is stationed, are being raided again and again by the R.A.F. For instance, a Middle East communiqué gives the following details of action on the night of January 22-23:—

"At Comiso a quantity of incendiary and explosive bombs were dropped causing explosions which continued for twenty minutes. Bombs were also dropped on Augusta aerodrome, but the results were not fully observed owing to low cloud. Several large explosions occurred in Syracuse and fires were started south of the bay. Other aircraft attacked the aerodrome at Catania and several fires and explosions took place near the runway and hangars. One stick of bombs landed in the middle of the railway junction north of the aerodrome. A particularly heavy explosion occurred followed by fires with heavy black smoke. All our aircraft returned safely from these operations."

In the Northern theatre of war the *Luftwaffe* has been very quiet for some time, but the R.A.F. bombers have defied bad weather and done a good deal of raiding of targets in territory occupied by the Germans. A story of a very chivalrous action has recently been published.

One night when heavy bombers of the R.A.F. were raiding Berlin, one of our aircraft failed to report to base. It had been shot about by anti-aircraft and was abandoned, the crew taking to their parachutes. Recently, however, letters have reached this country from prisoners of war camps in Germany which, pieced together, tell a tale which is worth recording. All the crew are now known to be safe. One of them, the navigator, has written to his wife: "I came down by parachute, unhurt." He then goes on to tell of the bravery of the captain of the aircraft, a sergeant pilot—who, incidentally, had come down from Oxford after his first year to join the R.A.F. "When it was decided that we must jump," says the letter, "I found that my parachute had been damaged. The captain ordered me to jump with his, and he, though wounded, made a successful landing with mine. He risked his life for me."

AIR LOSSES TO JANUARY 25.

	GERMAN	BRITISH		NEAR EAST	
	Aircraft	Aircraft	Pilots	Enemy Aircraft	British Aircraft
Jan. 19	6	—	—	19	—
" 20	—	—	—	8	1
" 21	—	—	—	—	1
" 22	2	—	—	1	1
" 23	—	—	—	6	—
" 24	—	—	—	8	—
" 25	—	—	—	1	—
	8	0	0	43	3

British bombers lost over enemy territory: Jan. 22, 1.

German losses by R.A.F. and ground defences in Northern Area, 4,204. R.A.F. aircraft lost in Northern Area, 1714.

In the Middle East the R.A.F. have destroyed about 714 enemy aircraft and have lost 89.

BOMBING RAIDS OVER GERMANY

More than 1,400 Areas Bombed Between Outbreak of War and January 1, 1941

THE increasing intensity of Britain's air offensive against Germany is revealed in maps recently issued in poster form for display all over the country by the Ministry of Information. These maps, prepared by the General Production Division of the Ministry, bring up to date the similar information issued at the end of September, and show that in the three months October-December, 1940, the number of raids by British aircraft on German territory was more than half the total number of raids in the entire preceding thirteen months of the war. At the end of September the number of target area attacks recorded was approximately 900. At the beginning of this year the figures stood at over 1,400.

The word "attack" here means the bombing of a particular target area containing one or more different types of objectives. Several such area attacks are, of course, usually made in a single night's operations. The classified list of bombed objectives over the sixteen months' period exceeds 1,500. The number of individual towns involved in attacks is over 270.

The heart of Germany's production machine—despite all frantic efforts to move its vulnerable factories eastward—is the congested Ruhr area with Krupps' great home-town Essen at its centre, and dozens of other important munition-making towns and railway centres from Munster in the north to Cologne in the south. Coal, steel, arms factories, chemical works and oil plants are crowded together in this vital area which has been given the most intensive hammering of any part of the Reich. Over 500 raids of the total of 1,400 up to the beginning of this year have been carried out successfully inside this heavily defended area. This onslaught on the Ruhr is one of the most striking facts indicated by this new map since, whilst raids over the rest of Germany increased by some 50 per cent. in the last three months of 1940, those on the Ruhr factories were increased by two-thirds in this period. This is particularly noteworthy in view of Goering's boast prior to the war: "I have convinced myself personally of the measures taken to protect the Ruhr against air attack. We will not expose the Ruhr to a single bomb dropped by enemy aircraft." Not one bomb but literally thousands of tons of bombs have wrought havoc in the Ruhr since then.

The whole of the Ruhr area lies within a radius of 350 miles from London, but Germany's two other greatest munition areas are set deeper into enemy territory. A hundred miles higher up the Rhine, and stretching from Frankfurt-am-Main to Stuttgart, with Mannheim as its centre, is another heavily industrialised region, important also for its chemical works and oil refineries. One town in this area—Mannheim—has had 34 raids. This is equalled in the Ruhr by Duisburg-Ruhrort (35), Cologne (55), the Ruhr oil centre Gelsenkirchen (40), and, of course, the rail-

BOMBING RAIDS ON GERMANY (Continued)

way centre Hamm, which tops the list with over 80 raids.

More difficult still to reach is Germany's other great centre of munition works and oil plants in the Leipzig area, some two hundred miles east of the Ruhr. The great synthetic oil industry there is based on the lignite or brown coal deposits of Saxony. The famous hydrogenation plant at Leuna, near Leipzig, normally has a production of up to half a million tons of synthetic oil a year. It has received some of the heaviest air attacks delivered by the R.A.F. Magdeburg, which has had 19 raids, is another of the most important centres of the synthetic oil industry. This industry produces the bulk of the supplies of aviation spirit for the German Air Force and of the high-grade diesel oil for the submarine fleet. Plants in various parts of Germany producing 90 per cent. of her total output of synthetic oil have been subjected to air attack. It must also be remembered that air attack on oil refineries helps to reduce not only petrol supplies but also Germany's scanty stocks of high-grade lubricating oil.

Even farther afield is another of Germany's important oil centres, at Pölitz, near Stettin, at the mouth of the Oder. A raid on Pölitz means a round trip of well over 1,300 miles, but it has, nevertheless, been bombed half a dozen times. Nearly as far is Berlin itself, which has had 35 raids.

Amongst the towns hardest hit are the shipping centres of North Germany. Her two greatest ports, Hamburg and Bremen, had been attacked up to the first day of this year 61 times and 52 times respectively. Kiel has had 32 visits, Wilhelmshaven 36 and Emden 27.

Disruption of communications is hardly less important than destruction of war materials, and heavy toll has been taken by the R.A.F. of Germany's docks, railway and canal facilities.

An analysis of the raids according to the more than 1,500 objectives named in the communiqués reveals that over a quarter of them have been attacks on railways and marshalling yards. Ships, docks and canals account for another sixth. The largest number—more than a third of the total—is made up of attacks on munition and aircraft factories, oil refineries, oil-storage plants and power stations. Aerodromes also figure prominently. The map deals only with Germany proper, and does not include the hundreds of raids carried out on aerodromes in German-occupied territories.

LIST OF R.A.F. TARGETS IN GERMANY ITSELF BOMBED FROM OUTBREAK OF WAR UNTIL JANUARY 1st, 1941

(Figures quoted after each name show number of raids made)

Aachen (8).
Ahaus (1)
Alderkerk (1).
Alt-Gaarz (1).
Altona (4).
Amrum (1).
Angermünde (1).
Arsbeck (1).
Aschersleben (1).
Augsburg (2).
Aurich (1).

Baden (1).
Bad Rheinfelden (1).
Barge (2).
Barmen (1).
Barnstorf (1).
Bassenheim (1).
Berlin (35).
Bernburg (2).
Bielefeld (2).
Bitterfeld (3).
Black Forest (5).
Boblingen (1).
Bochum (1).
Bolhen (2).
Bomlitz (2).
Bonn (5).
Bonninghardt (1).
Borkum (16).
Bottrop (7).
Bremen (52).
Bremerhaven (8).
Brunsbüttel (4).
Brunswick (1).
Buer (2).

Celle (3).
Coblenz (11).
Cologne (55).
Cuxhaven (11).

Danzig (1).
Darmstadt (2).
Deichshausen (5).
Delmenhorst (2).
Dessau (4).
Diepholz (8).
Distelrath (1).
Dollgergen (1).
Dormagen (1).
Dorsten (2).
Dortmund (20).
Dortmund-Ems Canal (15).
Dresden (2).
Duisburg-Ruhrort (35).
Dülmen (1).
Dümmer (1).
Düren (3).
Düsseldorf (19).

Ehrang (13).
Elbe Estuary (1).
Emden (27).
Emmerich (11).
Erkelenz (1).
Eschwege (5).
Eschweiler (1).
Essen (31).
Euskirchen (3).
Eystrup (1).

Fehmarn Island (1).
Finkenheerd (1).
Flensburg (1).
Frankfurt-Am-Main (17).
Frankfurt-Am-Oder (1).
Freiburg (1).
Fürstenau (1).

Geldern (5).
Gelsenkirchen (40).
Geseke (1).
Gifhorn (2).
Goch (1).
Gotha (3).
Göttingen (3).
Gremburg (8).
Grevenbroich (5).
Griesheim (2).
Gross-Korbetha (1).

Hage (2).
Halberstadt (1).
Halle (3).
Haltern (3).
Hamborn (4).
Hamburg (61).
Hamm (82).
Hanau (2).
Handorf (2).
Hanover (29).
Harburg (4).
Hattingen (1).
Heerdt (1).
Heide (1).
Heidelberg (1).
Heilbronn (1).
Heligoland (3).
Heligoland Bight (7).
Herdecke (2).
Herlingen (3).
Hildesheim (3).
Hitzacker (1).
Höchst (3).
Holtenau (2).
Homburg (17).
Hornum (4).
Hoya (1).
Huntlosen (2).
Hüsten (1).
Husum (4).

Ickern (1).

Jagel (1).
Jena (1).
Jever (1).
Juist (1).
Jülich (2).

Kamen (6).
Karlsruhe (1).
Kassel (8).
Kastrop-Rauxel (4).
Kelsterbach (1).
Kerkrade (1).
Kiel (32).
Kloppenburg (2).
Knapsack (2).
Kochem (1)
Kölleda (1).
Königshofen (1).
Krefeld (20).
Kreuzburg (1).

Langenhagen (1).
Langeoog (1).
Lastrup (4).
Lauta (1).
Lehe (1).
Leipzig (6).
Lemförde (1).
Leuna (10).
Leverkusen (4).
Lingen (5).
Lintorf (1).
Lippstadt (2).
Lohausen (1).
Lübeck (4).
Ludwigshaven (16).
Lünen (10).
Lützen (1).

Magdeburg (19).
Mainz (3).
Mannheim (34).
Marnheim (1).
Mecklenburg (1).
Meiderich (1).
Merseburg (1).
Merzig (1).
Metelen (1).
Midlum (1).
Misburg (7).
Monheim (11).
Mörs (2).
Mulhausen (2).
Mülheim (3).
München-Gladbach (7).
Munich (2).
Münster (14).
Mutterstadt (1).

Nackarau (1).
Neheim (1).
Neuhaldensleben (3).
Neumünster (1).
Neuss (2).
Nienburg (1).
Nohra (1).
Nordenham (2).
Norderney (18).
Nordhausen (3).
Nordhorn (1).
Nuremberg (2).

Oberharz Mountains (3).
Oberhausen (2).
Oberndorf (1).
Ohrtermesche (1).
Oldenburg (5).
Osnabrück (34).
Osterfeld (2).
Ostermoor (3).
Ostheim (1).
Ottersberg (1).

Paderborn (5).
Pilsen (2).
Pölitz (6).
Pretzsch (1).

Quakenbrück (3).

Rantum Bay (1).
Rathenow (1).
Rebstock (1).
Recklinghausen (2).
Rees (1).
Regensburg (1).
Reisholz (9).
Rendsburg (1).
Rheinberg (1).
Rheine (8).
Rheydt (6).
Riesenbeck (1).
Rötha (1).
Rothenburg (4).
Rudersdorf (1).
Rügen Island (1).
Ruhland (2).

Saarbrücken (1).
Salzbergen (5).
Salzhof (1).
Schildau (1).
Schlebusch (1).
Schonebeck (1).
Schwerte (13).
Siedenburg (1).
Sieburg (1).
Soest (35).
Solingen (1).
Soltau (1).
Speyer (1).
Spich (1).
Stade (3).
Stendal (1).
Sterkrade (6).
Stettin (1).
Stockum (1).
Stralsund (1).
Stuttgart (5).
Sundern (1).
Sylt (8).

Thüringen Forest (2).
Torgau (2).
Trier (3).
Türbingen (1).

Uberlingen (1).
Ulm (1).

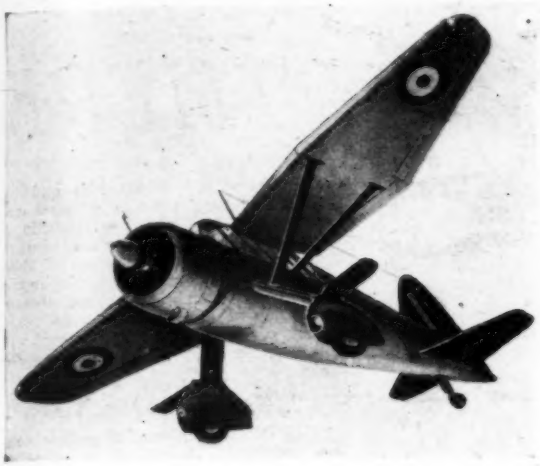
Varel (3).
Vechta (1).
Vegesack (1).

Waldeck (1).
Waldshut (1).
Wangerooge (2).
Wanne Eickel (5).
Warendorf (1).
Warnemünde (2).
Wedau (1).
Wenzendorf (5).
Werl (1).
Wernigerode (1).
Wesel (15).
Wesermunde (5).
Wesseling (4).
Westerholt (1).
Westerland (3).
Westhofen (1).
Wilhelmshaven (36).
Wismar (9).
Witten (1).
Wittenburg (1).
Wunstorf (2).
Würzburg (1).

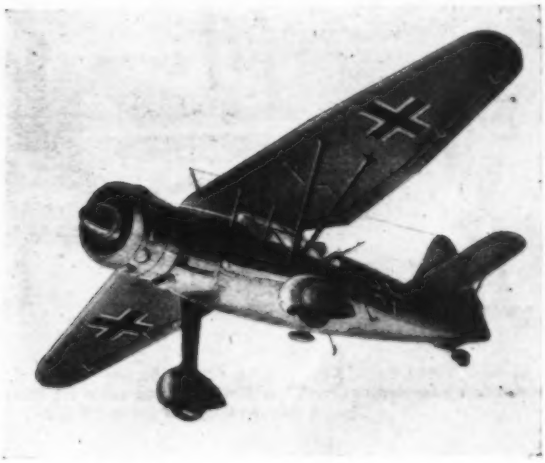
Zschornewitz (1).
Zweibrucken (1).
Zwischenhan (2).

FRIEND or FOE?

Spotting Enemy Aircraft : Characteristics to be Noted for Identification



Westland Lysander ; Two-seater. Strut-braced high-wing. Fixed undercarriage with stub-wings for bombs or supply-containers. Squat fuselage with totally-enclosed cockpit. Radial engine. Tail surfaces of large area.



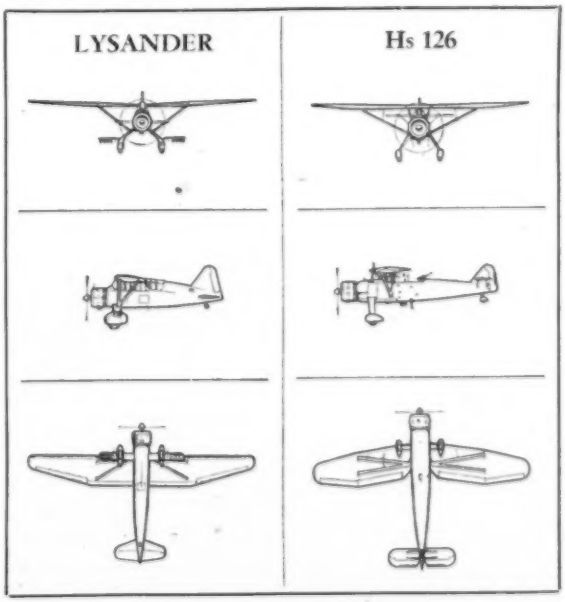
Henschel Hs 126 ; Two-seater. Strut-braced, parasol wing, back-swept. Fixed undercarriage. Semi-enclosed cockpit. Radial engine. Double strut-braced tailplane set high on fin.

ALTHOUGH the Westland Lysander, designed specifically for Army co-operation, is a familiar sight in Great Britain and is distinctive enough to be instantly recognised from any other British type by the veriest novice among spotters, it has a fairly close approximation in its German counterpart, the Henschel Hs 126, which has so far remained a distinct rarity over these shores. But with the accepted possibility of an attempted invasion by German forces, perhaps during the next few weeks, the likelihood of the Hs 126 putting in a definite appearance is not to be ignored.

As is the case with other "opposite numbers" among Allied and enemy aircraft, the Lysander and the Hs 126 have a number of distinct differences in spite of their strong general resemblance. It so happens that these two aircraft become quite different-looking machines when they present the spotter with a clear side-view. From this angle the British plane appears as a short, squat machine with its wing-roots anchored to the apex of its lofty cabin, whereas the Henschel has an altogether longer and slimmer appearance.

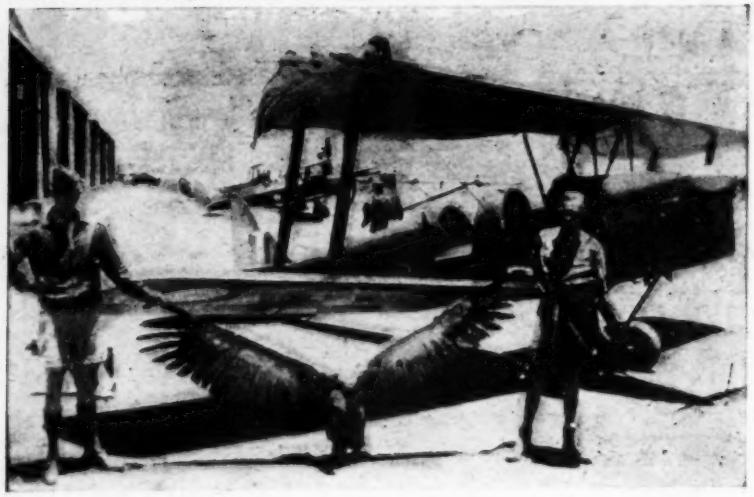
Sharp differences in other details will also be seen from this aspect. In the case of the Lysander the V-struts meet the legs of the undercarriage at the bottom of the fuselage, but on the Hs 126 the "legs" are well forward of the wing-struts. The Lysander's tailplane is mounted level with the bottom of the fuselage and follows the cantilever principle found on most British machines, whereas that of the Hs 126 is mounted high on the fin and is externally braced with double struts. Yet another difference is that the Lysander pilot sits with his head practically level with the leading-edge and his windscreen projects well in front of it. But the pilot's cockpit of the Henschel is just behind the narrow centre-section of the wing, the trailing-edge of which has a pronounced cut-out immediately above the windscreen. A comparison between the two half-tone pictures above and the two centre diagrams showing side-views will be particularly helpful here.

When seen head-on, or nearly so, the presence of stub-wings just above the wheel-spats will help to identify the machine as a British Lysander, but stress should be laid on the fact that, as these are detachable and are occasionally "not worn," their absence must not be relied upon to establish hostile identity. Neither should it be forgotten, of course, that the wily Hun might suddenly decide to add deceptive stub-wings to his Henschel when co-operating with his would-be invaders.



The wings of both these aircraft are of unusual design, and they can readily be identified when seen from directly below. In plan, the Lysander wing appears to be swept forward (though this is not actually so), and the Hs 126 has a definite back-sweep. From a head-on view, about the only way to differentiate between the two rival aircraft is to look at the centre-section of the wing. On the Lysander it is broken by the top of the cabin to which it is attached, whereas the Henschel is a "one-piece" parasol wing anchored to the fuselage by centre-section struts and clear of the half-covered cockpit aft of the trailing edge.

Next week: Lockheed Hudson and Me 110.



WHEN EAGLE MEETS TIGER. Peter Strong, of the South African Air Force, was doing aerobatics on a Tiger Moth when an eagle hit his right wing. He made a safe landing, but the eagle didn't.

HERE AND THERE

Oriental Airline

NEGOTIATIONS are taking place with a view to extending to India the airline between China and Burma, and a survey flight from Chungking to Delhi has just been made by representatives of the Chinese National Aviation Corporation, with which American interests are associated.

"P.B.'s" New Book

MR. PEMBERTON-BILLING'S new book was published last Monday. Its title is "Defence Against the Night Bomber," and the price is 2s. 6d. Published by Robert Hale, Ltd., of 102, Great Russell Street, London, W.C.1, the book contains 190 pages and an introduction by C. G. Grey. Comments on the book will be found on "The Outlook" pages of this issue.

Russo-Chinese Airline

MOSCOW is now reported to be linked with Chungking, seat of the Chinese Government, by a regular airline service recently inaugurated.

Three different companies operate the service in three sections. "Aeroflot," a Soviet organisation, flies its Douglas D.C.3 machines over the first stage between Moscow and Alma Alta. From here to Hami a Sino-Soviet company, "Hamiata," take up the running with the same type of machines, and the third stage to Chungking is covered by "Eurasia," a Chinese concern, using Junkers Ju 52s. Incidentally, the Chinese Ministry of Communications has a share in the company operating the middle section of this service.

Nazi Nerve!

WITH news of final agreement between the U.S. and British Governments on the location of sites in the island of St. Lucia, West Indies, to be leased to the former for the establishment of air bases, comes other news of the timely discovery of a German attempt to set up a secret air-base on the west coast of the negro republic of Haiti, less than 100 miles across the water from a U.S. naval base in the south of Cuba. The "aerodrome" had been acquired, a bit at a time, by a number of German farmers who had camouflaged the extensive site by breaking it up with trees and shrubs sunk in boxes. But, unfortunately for this piece of Nazi craftiness, an American civil pilot spotted some suspicious activities among men with motor lorries and promptly reported the matter to the authorities, with the result that the Germans were dispossessed of their aerodrome in a perfectly constitutional manner—and just in time, apparently!

Republic Lancer

SOME additional particulars of the Republic Lancer, of which a drawing was given on page 53 of our issue of January 16, are now available. The type number of this high altitude single-seat monoplane fighter is P-43 and it is powered with a Pratt and Whitney R-1830-35 Twin Wasp of 1,100 h.p. driving a Curtiss electric constant-speed airscrew. The normal fuel capacity is 145 U.S. gals. (121 Imperial gals.), but an overload of another 73 U.S. gals. is possible. The total loaded weight is 6,900 lb., the empty weight is 5,477 lb., so giving a useful load of 1,423 lb. The wing area is 223 sq. ft., making the wing loading 31 lb./sq. ft. Span is 36ft. and length 27ft. 10in. Dihedral angle is 4 deg. and the aspect ratio is 5.79. Armament is 30 and 50 calibre machine guns in the wings and fragmentation bombs are also carried.

"The First of the Few"

THIS is to be the title of a film dealing with the life-work of the late R. J. Mitchell, the designer of the Spitfire, and it has for its inspiration the famous words of Mr. Winston Churchill that, "Never in the field of human conflict was so much owed by so many to so few." The film is to be produced with the co-operation of Mrs. Mitchell, Messrs. Vickers-Armstrong and the Air Ministry. The task of dovetailing information about "R. J." has already been started by George King and John Stafford.

Although Mr. Churchill, when he made what has already become an historic observation, was unquestionably referring to the gallant young men who flew the Spitfires and Hurricanes and by their unflinching courage defeated the enemy's day bombers, yet the title of the projected film serves to remind us of that comparatively small body of men, the aircraft designers, whose magnificent work placed such effective machines in the hands of British pilots. To them, among whom the late R. J. Mitchell was a leader, the country also owes its gratitude.

J. G. Weir in New York

ACCORDING to our American contemporary, *Aviation*, Air Commodore J. G. Weir has been appointed Controller-General of Supply for the British Purchasing Commission, 15, Broad Street, New York City.

Focke-Wulf "Kurier"

DEVELOPED from the Focke-Wulf "Kondor" commercial aeroplane, which made non-stop flights across the Atlantic, the "Kurier" produced by the same firm has four engines, is said to carry an enormous bomb load over long distances, and carries powerful armament, including shell guns. De-icing equipment is fitted. The machine is stated to carry a crew of six.

A.R.P. in America Now

AIR-RAID exercises which recently took place in New York and New England areas show that America is thoroughly alive to the need for preparing for the worst in these troublous times. Some 10,000 civilian and coast-guard observers are reported to have taken part in the defence plans when "enemy" bombers carried out a raid, and air-raid drills for workers were another feature of the four-day exercises. Black-out tests are also mentioned as part of the new defence plans.

"Aircraft Production"

IN addition to its regular features, the February issue of our sister journal, *Aircraft Production*, contains the second instalment of the article on how the Blenheim is produced in a shadow factory. American methods of press tool technique are described in a most interesting and informative survey which cannot fail to be of considerable use to British works personnel.

The special problems of the aero engine constructor are always interesting, and the article on the effects of perfect surface finish on friction and lubrication, based on recent American research, throws interesting light on a subject which is still engaging the attention of many. The article on welding, begun in the December issue, is continued, and deals with the assembly of the rear portion of fuselages, and the truing up and alignment of the whole structure.

EYES for the ARMY

EARLY WORK : Army limbers towing a Cody biplane on Laffans Plain.

The Evolution of the Army Co-operation Aeroplane

HOW military aviation began as purely an adjunct to the Army and how Army Co-operation was thus the real basis of the present Royal Air Force is recorded in this article, illustrated entirely by Flight photographs.

ALTHOUGH the Army Co-operation Command appears almost as a new offshoot of the Royal Air Force, it performs, in fact, the actual basic duty for which military flying originally came to be practised. Since men drew swords against their brothers there has been the need for looking over the hilltop to see what the other fellow is doing. Thus from the days of man-lifting kites and spherical balloons their military use for reconnaissance has predominated. The early history of Army Co-operation is thus identical with that of the Royal Air Force itself.

The first occasion on which an aircraft of any kind was used on active service dates back as far as 1794, when the triumphant French republicans employed a captive balloon at the battle of Fleurus. Great Britain, late as usual, started military experiments with balloons in 1878, nearly one hundred years later, with a detachment of the R.E.s at Woolwich Arsenal. By 1879 there was in being what was called at that time a reliable *fleet* of five balloons and the trained men to handle them. They were under the command of one Captain Lee, who can, therefore, be said to be the original C.A.S., and everything that goes with it, of the Royal Air Force.

A step forward came in 1880, when this experimental balloon section—it was not yet officially recognised—was allowed to take part in the Aldershot manœuvres. Between the desire for something with which to look into the opposing camp and the hatred of anything new-fangled which would upset text-book soldiering, the military balloon was considered a qualified success. In 1884 some balloons were taken on service in the Bechuanaland campaign, but they were not used to any extent since there was no fighting. At this time Majors Elsdale and Templer were the moving spirits. They foresaw the uses of aerial photography, and they experimented with cameras attached to small free balloons. These had small clockwork motors fitted to operate the camera shutter and then rip the balloon in such a manner as to bring it gently to

ANGLO-FRENCH : An 80 h.p. Blériot of the type which No. 3 Squadron took to France in 1914.

PRE-R.A.F. LINE UP: Henry Farmans (nearest camera), a Maurice Farman Longhorn and two B.E.s. of the R.F.C. on the tarmac in 1914.

A BRILLIANT FORERUNNER: (Left) The original 50 h.p. Avro 504. From this was developed the 80 h.p. type which No. 5 Squadron took to France.

earth without damage to the camera.

Thus, by dint of exceptionally hard work on the part of a few far-sighted enthusiasts, the Balloon Section found favour in official eyes, and in 1890 it became an official unit of the Royal Engineers.

For some 20 years after this forward move military aeronautics in England languished somewhat. Whether it was realised at the time will never be known, but the aeroplane (servant and not, as in the case of the balloon, master, of the pilot) was wanted. There had been some activity. Experiments with man-lift

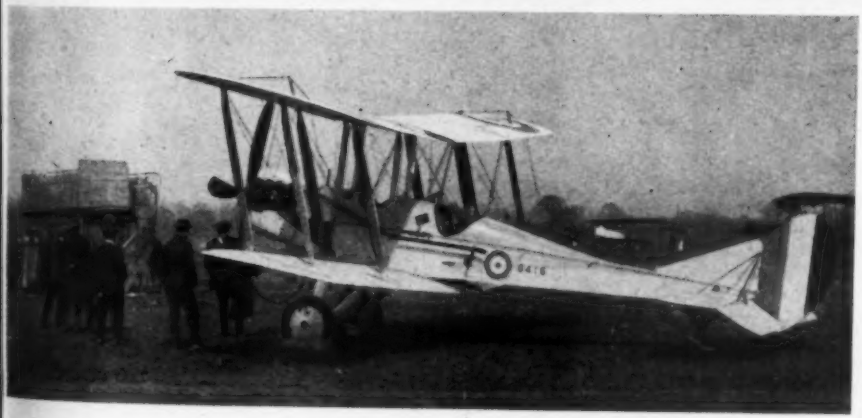
SOLID TYRED: Squadron transport at the concentration camp at Netheravon in 1914.

CONVERSATION PIECE: (Below) R.F.C. and Army officers in front of a Maurice Farman Shorthorn (note the drooping ailerons). The three officers on the right of the picture are Col. T. O'Brien Hubbard, Gen. Brancker and Gen. Sykes.

EYES FOR THE ARMY (Continued)

UPAVON 1914 : In the foreground are two Maurice Farman Longhorns (70 h.p. Renault) with a Henry Farman overhead. The Longhorn had a maximum speed of 50 m.p.h

THE BLOATER: (Below) The B.E.8 which had an 80 h.p. Gnome. It was the only B.E. type to have a rotary engine.



D.H. DESIGNED :(Above) The B.E.2 had a 70 h.p. Renault engine and lateral control was effected by warping the wings. The covered wheels were an innovation at that time.

B.E. DEVELOPMENT : Balanced ailerons were used on the B.E.2.c. and a small fin had been added. The engine was a 90 h.p. R.A.F. and the top speed was 72 m.p.h.

SINGLE BAY B.E. : The top wing of the B.E.2.e. had a pronounced overhang and only a single pair of interplane struts on each side.

EYES FOR THE ARMY
(Continued)

TWELFTH EDITION: The B.E.12 had a 150 h.p. R.A.F. engine installed. Its speed was round about 100 m.p.h.

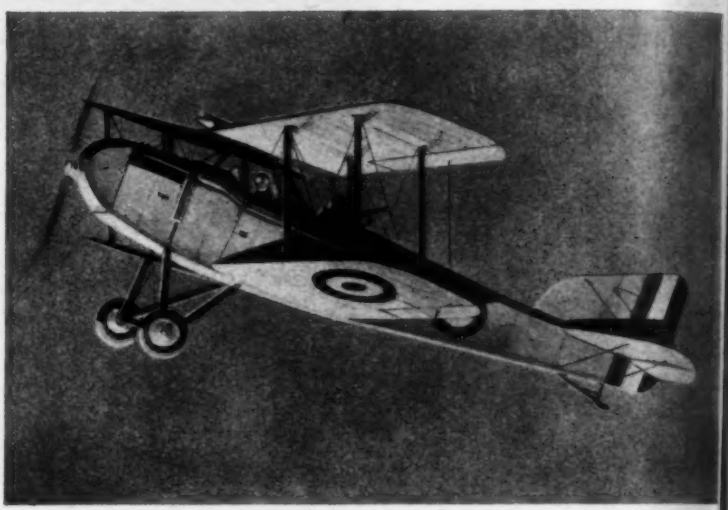
"BIG ACK": (Below) Armstrong-Whitworth's second design to go into production, the F.K.8 (160 h.p. Beardmore), was known as the Big Ack.

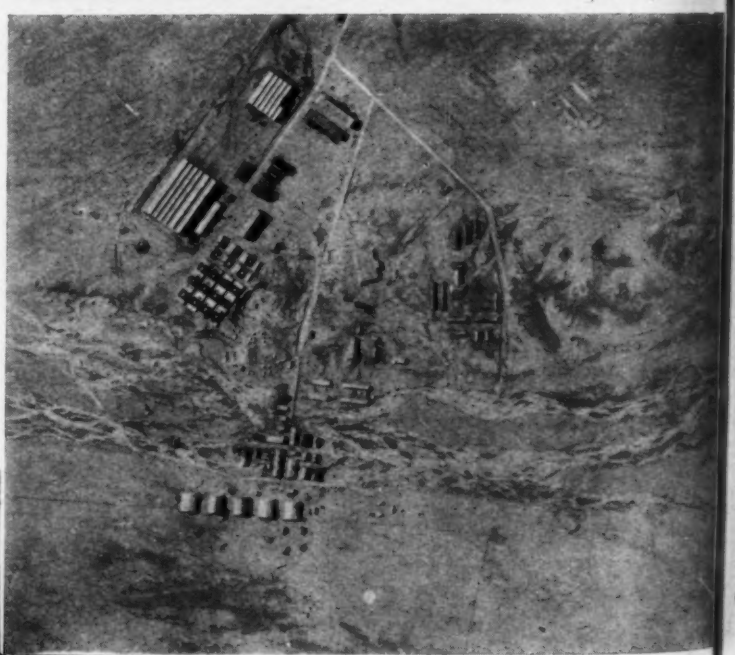
ing kites were started round about 1904, and for a while the Army turned its thoughts in the direction of small, non-rigid dirigible airships. Meanwhile heavier-than-air flying had progressed abroad, and it is interesting to note here that the Wright brothers offered their invention to the British Admiralty, only to have it refused.

R.E. Air Battalion

By 1909-10 the aeroplane had shown itself a serious means of transport. Flying meetings were being held in various countries, England included, and Blériot had flown the Channel. Again it was the lone enthusiast who pulled our chestnuts out of the fire. Captain Fulton bought a 28 h.p. Blériot monoplane and experimented with it on Salisbury Plain. Captain Dickson—who, incidentally, was involved in the first collision in the air—joined the British and Colonial Aeroplane Company (now Bristols) and appeared at the 1910 manœuvres with a 50 h.p. Bristol box kite. He was not received with acclamation. The cavalry, who were responsible for reconnaissance, were perturbed lest he frightened their horses!

Progress is inevitable. In 1911 we realised that the French Army already had some hundreds of Farman biplanes available for operation with cavalry, infantry and artillery. The French have always been great artillerists and at once appreciated the advantage of the aeroplane for co-operation with the artillery. It is safe to say that at this time France had a lead of several years on both ourselves and Germany. Under the



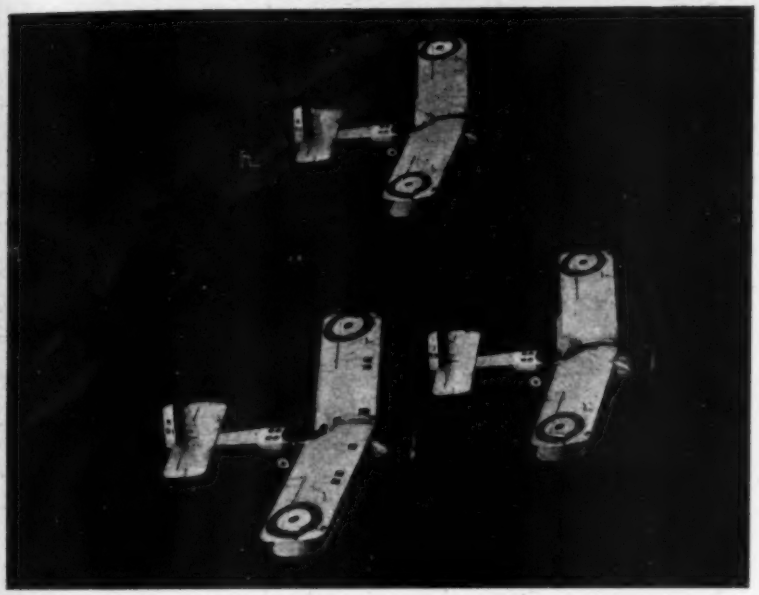


MIDDLE EAST EDUCATION: (Above) A vertical photograph of the Artillery Observation School at Almaza, Egypt, during the last war. The C.O., Major J. O. Archer, and Capt. C. E. W. Lockyer, one of the flight commanders, are both Group Captains now. It was taken during one of the rare occasions when the camp was flooded out.

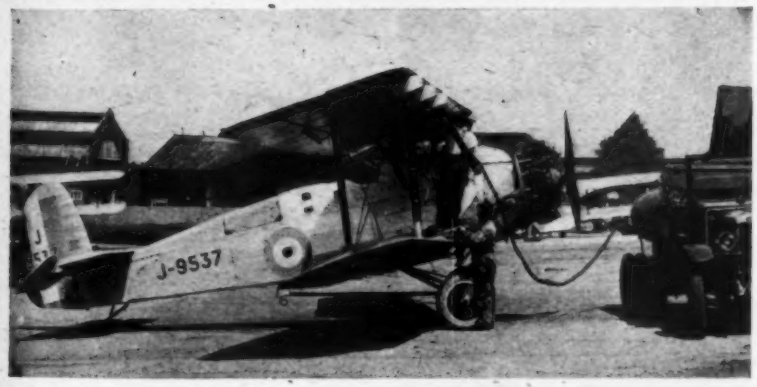
FORCED LANDED: An R.E.8 down in the shadow of the Great Pyramid of Cheops. Engine reliability was not 100 per cent. in 1917.

EYES FOR THE ARMY (Continued)

"POST WORLD WAR I": (Below) Three Armstrong-Whitworth Atlasses of No. 26 (A.C.) Squadron in 1933. Wireless was placed just aft of the rear gunner.



"HARRY TATES": (Above) R.E.8s. on the desert aerodrome at Almaza, near Cairo, in 1917.



WITH ONE OF THE ORIGINALS: An Atlas of No. 4 (A.C.) Squadron refuelling. The Atlas was all-metal construction with fabric covering.

CURRENT AFFAIR: (Below) Testing wireless circuits of an installation in an A.W. Atlas.

bludgeon of circumstances a British Army Order was issued in February, 1911, creating the Air Battalion of the Royal Engineers.

The actual wording is interesting. It was: "With a view to meeting Army requirements consequent on recent developments in aerial science, it has been decided to organise an Air Battalion, to which will be entrusted the duty of creating a body of expert airmen. . . . The training and instruction of men in handling kites, balloons and aeroplanes, and other forms of aircraft, will also devolve upon this battalion. The establishment of this battalion will be organised into (i) headquarters, and (ii) two companies. . . . The officers will be selected from any regular arm or branch of the Service on the active list. . . . A selected candidate will, on joining the Air Battalion, go through a six months' probationary course. . . . An officer who satisfactorily completes the probationary period will be appointed to the Air Battalion for a period of four years. . . . The Warrant officers, non-commissioned officers and men will be selected from the Corps of Royal Engineers. The existing Balloon School will be superseded by the Air Battalion, and the new organisation will be regarded as taking effect from April 1st, 1911." Whether the date for "taking effect" was decided with the tongue in the cheek, or whether by chance, will never be known. Suffice it to say that every major development of the Royal Air Force as we know it to-day has had the same time of the year for "taking effect."

The year 1911 was notable, from the army co-operation point of view, in that it was the year in which Captain G. de Havilland produced the B.E. in the Royal Aircraft Factory (now the Royal Aircraft Establishment) at Farnborough. Although military trials were held during the following year in the quest for the best aeroplane, and the competition was won by Cody, none was as good

HAWKER-ROLLS : An Audax of No. 16 Squadron in 1934. The wireless aerial and message picking-up hook are clearly shown. The Rolls Kestrel engine gave the Audax a speed of 152 m.p.h.

as the B.E.2, which reached a ceiling of no less than 9.500ft. in 1 hour 20 minutes. It was on developments of this machine that hundreds of pilots were to carry out army co-operation duties in the 1914-18 war.

Anxious to prove itself, the new Air Battalion sent five machines—early Farmans and Bristol box kites—to take part in the 1911 manœuvres at Cambridge. Captain Brooke-Popham (now C.-in-C. Far East) started from Larkhill in a Farman, intending to get to Oxford the same day, a distance of 55 miles. There was a little wind, and his top speed was only 30 m.p.h. He was held up and stayed overnight at Wantage, 30 miles from his start, and flew on to Oxford the next day. After restarting, he came to earth with engine trouble in the first ten miles, breaking the tail skid on landing. After repairs, the engine gave further trouble on the take-off, and the machine crashed in the resultant forced landing.

Another machine, piloted by Lt. Reynolds, was thrown on to its back by a bad bump (machines were only loaded about 3 lb. to the square foot in those days) the pilot falling on to the underside of the top plane. From this attitude it did a slow roll on its own, then a tail slide, and, finally, a falling leaf to the ground. Lt. Reynolds jumped the last ten feet and got away with it. Out of the five machines which started only two arrived at Cambridge. These were piloted by Lts. Barrington-Kennett and Cammell. After all their trouble they found the manœuvres had been cancelled owing to drought.

The Royal Flying Corps was formed from the Air Battalion in 1912, with both naval and military wings, but it is only the latter with which we are concerned at the moment. Its work was based entirely on co-operation with the Army. The establishment authorised was H.Q., seven aeroplane squadrons, one airship squadron and one kite squadron, but the seven squadrons were rather "theoretical," and at its inception it took on charge one B.E., one Breguet and two Bristol box kites.

Having now become officially recognised, and having aeroplanes which—even if unreliable—would fly, it was natural that more time and thought should be devoted to such things as wireless communication and photography. Early in 1912 a Capt. Lefroy was flying with Geoffrey de Havilland in the first B.E., testing-out radio transmission from the air. This, of course, was telegraphy only. Screened magnetos made their appearance in 1913 and, by 1914, a range of from ten to twenty miles between air and ground stations was found possible. On the outbreak of war in 1914 the wireless unit was attached to No. 4 Squadron, which was itself formed from a flight detached from No. 2 Squadron. From this unit grew the whole wireless service of the Royal Flying Corps.

The Royal Flying Corps

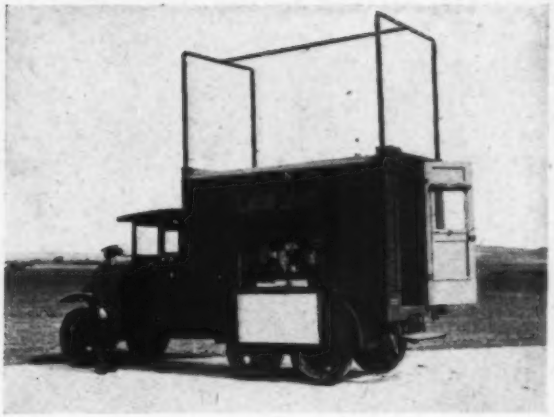
At this time army commanders were still sceptical as to the use of the new arm. So much so that instructions had to be issued from the War Office to the effect that pilots' reconnaissance reports were to be taken seriously. To produce evidence which could not be disregarded, photography from the air began to be seriously considered in the early part of 1914. There were no cameras issued, and officers used their own private apparatus. In the gentle slipstreams of those days no trouble was experienced by bellows being blown in. In spite of obvious difficulties, a complete set of photographs of the defences of the Isle of Wight was taken in one day from 5,000ft.

This is typical of the energy and interest shown by these early army co-operators. To illustrate this point let us quote from *Flight* of 1914. We had been invited by Brigadier-General Sir David Henderson to attend the concentration camp (horrible expression) at Netheravon, and are describing the day's work. "Flying usually takes place in the morning and evening between 4 a.m. and 6.30 a.m. and 4.45 p.m. and 8.15 p.m. (This was on account of the calm air usually found at these times.) Not infrequently flights are made earlier than this. As a pilot becomes more expert he is also required to make cross-country

PIN POINT OR OVERLAP : Aircraftmen fitting a Williamson aerial camera in an Audax belonging to the School of Army Co-operation in 1934.

EYES FOR THE ARMY (Continued)

SCHOOL OF ARMY CO-OPERATION : The exterior and interior of a mobile wireless station in 1934



flights during the day. Lectures on various subjects are given between 12 noon and 1 p.m., and the remainder of the day is spent in the workshops. Keenness may be appreciated by personnel giving up their *spare* time to make themselves more efficient." The italics are 1941 vintage. Brig.-Gen. Sir David Henderson himself (he served with distinction at the battle of Khartoum in 1898) learned to fly when he was fifty.

In 1914 the first R.E. (Reconnaissance Experimental) machine was designed at the Royal Aircraft Factory at Farnborough. It was the eighth variant of this which was to become the standard army co-operation machine of the eventful years 1917 and 1918.

And so we come to the outbreak of war in August, 1914, which was to prove whether any of these preconceived ideas would work on the battlefield. Nine days after the commencement of hostilities the first machine flew to France. It was flown by Lt. H. D. Harvey Kelly, of No. 2 Squadron. He left Dover at 6.25 a.m. and landed at Amiens at 8.20 a.m.

Four squadrons in all went to France with an assortment of machines. No. 2 and 4 Squadrons had B.E.2s; No. 3 had Blériot monoplanes and Henry Farmans, and No. 5 Squadron Henry Farmans, Avros, and a B.E.8, which was affectionately or otherwise known as "the bloater." The first reconnaissances of the war were carried out by Captain Joubert de la Ferté (now Air Marshal) in a Blériot of No. 3 Squadron, and by Lt. G. W. Mapplebeck in a B.E. of No. 4 Squadron. Although these machines were two-seaters, both went single handed.

1914-18 War

Of the confused period during the retreat from Mons it is difficult to get a comprehensive story and to assess what work was done. It is, however, quite certain that this new form of reconnaissance was instrumental in saving the British Expeditionary Force from encirclement by Von Klück's army. Sir John French, the British Commander-in-Chief in France, paid grateful tribute to the work of the squadrons. In his very first despatch, dated September 7, 1914, he said: "I wish particularly to bring to your Lordships' notice the admirable work done by the Royal Flying Corps under Sir David Henderson. Their skill, energy and perseverance have been beyond all praise. They have furnished me with the most complete and accurate information, which has been of incalculable value in the conduct of operations. Fired at constantly both by friend and foe, and not hesitating to fly in every kind of weather, they have remained undaunted throughout. Further, by actually fighting in the air, they have succeeded in destroying five of the enemy's machines."

Almost from the beginning reconnaissance aircraft became known as Corps machines. Squadrons were attached to Corps H.Q., and each had one wireless machine from No. 4 Squadron. Artillery co-operation was not adopted seriously until the Germans took up fixed posi-

IN THE ROUGH : A W/O photographer pins a photo mosaic together.

PEACEFUL WAR : (Left) Artillery observation practice by No. 16 (A.C.) Squadron from a Hawker Audax. The puffs represent shell bursts.

tions on the Aisne. The first shoots were nothing more nor less than a long-hand description in Morse code of what the airman saw, such as "a little to the right and 100 yards over," "50 yards short," "a hit," and so on. In fact, it wasn't unknown for the pilot to land and hold a conversation with the battery as to where the shell had fallen.

By early 1915, however, the clock code had been instituted. This consisted of a map or a photograph on which had been superimposed eight concentric rings representing 10, 25, 50, 100, 200, 300, 400 and 500 yards distance from the target. These circles were lettered and, according to where the shell was observed to fall, it was only necessary for the observer to signal the appropriate circle letter and the position on that circle such as 6 o'clock, 3 o'clock, or wherever it might be. For a direct hit "O.K." was sent. In our best traditions we were woefully short of shells at the time, and this system of ranging saved many a precious day's supply, while the higher-ups at home talked about increasing the supply and the lower-downs decided it was a heaven-sent opportunity to strike for more pay.

As trench warfare became more intense, and supplies of guns, ammunition and aircraft increased, trouble was experienced in working shoots close to one another. There were no short-wave wireless sets in those days, and only a certain number of aeroplanes could work in a given area. This worked out at about one in 2,000 yards of trench frontage as the limit, until a device was found by which the pitch of the transmitted note could be altered and so avoid jamming. Immediately the density ratio of planes to sector could be at least doubled.

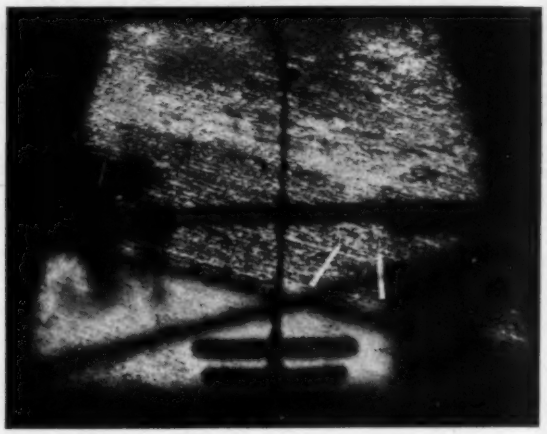
MODERN STYLE (Above) : A Westland Lysander picking up a message. The stub wing bomb-carriers are clearly apparent in this view.

GROUND STATION : The neat and compact wireless apparatus in use in 1934.

EYES FOR THE ARMY (Continued)

HOVERING (Left) : A "Rota" or C.30 Cierva Autogiro slow-flying.

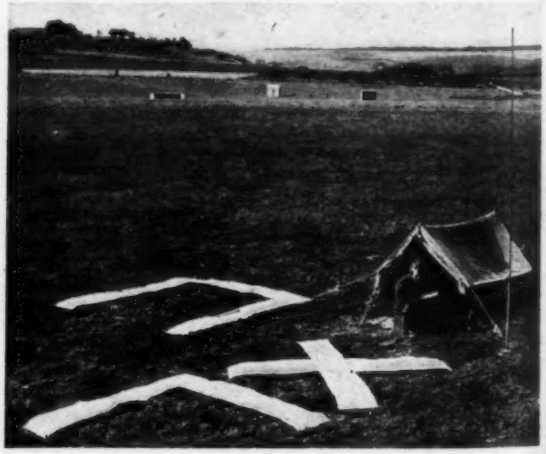
MESSAGE PICKING-UP (Below) : The strips and posts as seen through the prone bomb-aimer's window of a Hawker Audax.



Until April, 1916, it had been customary for photographic work to be done at headquarters only. This entailed a great waste of valuable time, and so it was decided to have photographic sections comprising an N.C.O. and three men at each station. It must not be thought that these sections all enjoyed travelling darkrooms, or even good buildings; most of the work was carried out in converted B.E. cases.

Gradually our strength was built up, and the first really big attack took place on the Somme. This lasted from July 1st until November 17th, 1916, and between two hundred and three hundred Corps machines were in service in the area covered by the operations. During this period alone some 9,000 targets were registered, over 19,000 photographs taken, and from these photographs nearly half a million prints were produced. Army Co-operation was an accomplished fact. The foregoing will give some idea of the way in which the army co-operation squadron has reached its present-day efficiency. Broadly speaking, it represents a quarter of a century's development of these fundamentals.

Spotting from kite balloons has not been forgotten, neither has contact patrol (we will tell both of these stories another day), but there is one other side which comes to mind when we remember the gallant re-arming and re-victualling of the Calais garrison during the Dunkirk



EYES FOR THE ARMY (Continued)

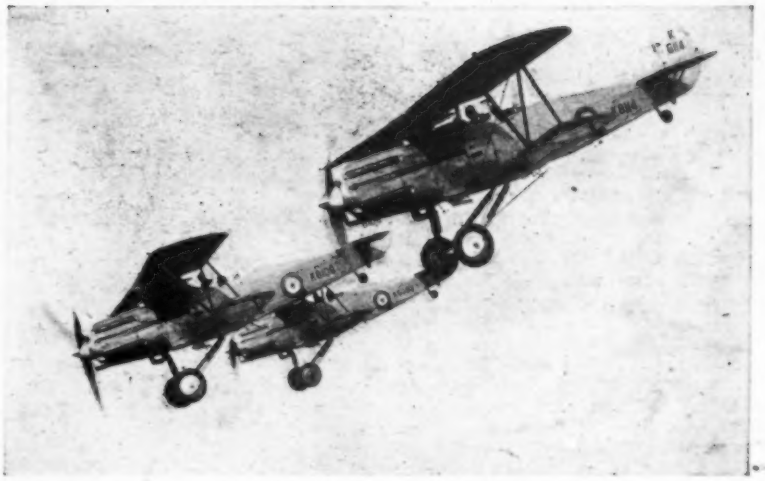
evacuation last year. The classic forerunner of this epic was the attempt to drop sufficient supplies to General Townsend's men who were besieged in Kut-el-Amara in 1916. There were just over 17,000 persons to cater for, and Gen. Townsend asked for 5,000 lb. of food per day. Nine aircraft were available for the task: four B.E.2.c.s, one Voisin, one Henry Farman and three Short seaplanes. These last five belonged to the Navy.

Release gear was quickly designed, and it was found that the B.E.s could carry a 50 lb. bag alongside the fuselage on each lower wing and a further two 25 lb. bags between the undercarriage struts. The Voisin and Henry Farman each carried approximately the same load under the nacelle, while the Short seaplanes carried their greater load of 250 lb. held up by canvas bands to keep the supplies from the water. The distance from the aerodrome to Kut was about twenty-three miles, and in all some 140 supply-dropping flights were made. In the fifteen days between the 15th and 29th of April, no less than 19,000 lb. weight of food was dropped. The first day was the most successful, with a total of over 3,500 lb. Unfortunately, all this effort was to no purpose, since the garrison had to surrender.

The Machines

Flying the types prior to the B.E. and Avro 504 (the latter, by the way, never became an A.C. type in any quantity, although it was built in vast numbers for other purposes) was rather like flying a piece of brown paper. There was little or no speed range, and the light loadings put them at the mercy of bumps or "air pockets," as we called them then. It was thought that these were caused by patches of "thin" air.

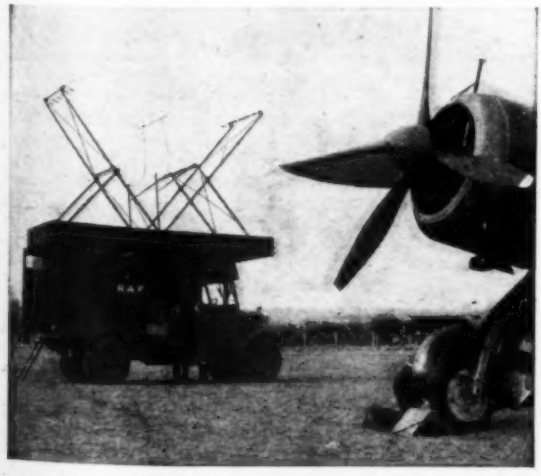
The writer's most vivid memory of the B.E., and common to its numerous variants, is draught. The deeply cut-away cockpit sides (presumably to allow beefy army personnel to boil over from the narrow fuselage) could produce a draught of unbelievable intensity. It was, however, extremely stable in the air. Automatic stability was considered at that time to be a very desirable feature. Pro-



FINAL BIPLANES: (Above) The 805 h.p. Napier Dagger-engined Hawker Hector was the last biplane type to be issued to A.C. Squadrons. Its speed was 187 m.p.h. at 6,500ft. The port gun chute can be seen between the upper and lower exhaust manifolds.

PRACTICE FOR CALAIS: (Above) Parachute supply containers being dropped from a Lysander. The rear gunner has slid his cockpit cover back.

FOR RE-ARMING: (Below) Filling a parachute container with small-arms ammunition. The soft aluminium nose of the container is designed to absorb the landing shock.



UP-TO-DATE: The mobile wireless equipment of a modern A.C. Squadron.

EYES FOR THE ARMY
(Continued)

vided one was not in a hurry, and provided also that the engine kept going, there was a lot to be said for the old B.E. in all its different guises.

The B.E. was overdue for replacement when the R.E.8 put in an appearance in quantity. The R.E.8 was the first machine to be issued which had tail trimming gear. It was, unfortunately, one of those unlucky types to get a bad name. In the hands of a good pilot it had an excellent performance for its time, but there is no denying the fact that lots of pilots lost their lives on it because of the expectation that they would do so. The undercarriage was definitely

IN ECHELON : (Above) The peculiar wing form and spatted undercarriage makes the Lysander unmistakable in the air.

ON PARADE : (Left) No. 16 (A.C.) Squadron with their Westland Lysanders shortly before the war.

weak. It was composed of nothing more or less than faired gas pipes. At the Artillery Observation School in Egypt these undercarriages averaged two landings each, until someone had the brainwave of making some out of ash. None was broken after this except in definite crashes.

Contemporary with the B.E.2.c and R.E.8 were two Armstrong-Whitworth types. The earlier of these two resembled the B.E. very closely and was powered in like manner by a 90 h.p. R.A.F. engine. Towards the end of 1916 a larger and improved type was designed. This was the F.K.8, or "Big Ack." It was on one of these that 2nd Lt. McLeod won the V.C. in 1918. The official citation reads: "Whilst flying with his observer (Lieutenant A. W. Hammond, M.C.) attacking hostile formations by bombs and machine-gun fire, he was assailed at a height of 5,000ft. by eight enemy triplanes, which dived at him from all directions, firing from their front guns. By skilful manœuvring he enabled his observer to fire burst at each machine in turn, shooting three of them down out of control. By this time Lieutenant McLeod had received five wounds, and whilst continuing the engagement a bullet penetrated his petrol tank and set the machine on fire. He then climbed out on to the left bottom plane, controlling his machine from the side of the fuselage, and by side-slipping steeply kept the flames to one side, thus enabling the observer to continue firing until the ground was reached. The observer had been wounded six times when the machine crashed in 'No-Man's Land,' and Second Lieutenant McLeod, notwithstanding his own wounds, dragged him away from the burning wreckage at great personal risk from heavy machine-gun fire from the enemy's lines. This very gallant pilot was again wounded by a bomb whilst engaged in this act of rescue, but he persevered until he had placed Lieutenant Hammond in comparative safety before falling himself from exhaustion and loss of blood."

From the close of the last war until the A.W. Atlas was issued, several different machines were in service with the A.C. squadrons. They were, however, all surplus war types, such as D.H.9s and Bristol Fighters, and were only stop-gaps for a period of financial recuperation after the ravages of 1914-18. In its original form the Atlas was quite a good aeroplane, but added weight and added excrescences gradually robbed it of all its speed range. At one time it got so bad that it was unsafe at much below 80 m.p.h. and had a top speed of only 107 m.p.h. Despite this, the writer can remember having one demonstrated for him by a C.F.S. instructor with the A.S.I. reading 45 at 1,000ft. It felt rather like a slow bicycle race on a tight-rope. The Hawker Audax had all the excellent qualities of the famous Hart family, of which it was a member, and the Hector, of course, was an almost identical airframe with a 24-cylinder Napier Dagger. This engine, with its multiplicity of "pots," was a sweet thing to fly behind.

A number of Cierva Autogiros of the C.30 type are in use with the A.C. squadrons. These are known in the Service as Rotas.

In designing and manufacturing the Lysander, Westlands were able to concentrate entirely on the production of a specialised A.C. machine as distinct from an adapted design or type, and right well they have succeeded. Interconnected lift slots and flaps and the 900 h.p. from a Bristol Perseus engine gives a speed range of 55 m.p.h. to 230 m.p.h. when fully loaded. The near-parasol wing arrangement gives excellent visibility to both occupants. Economy of space has been achieved by putting the forward-firing guns and landing lights in the wheel fairings. Detachable stub wings carry racks for bombs or for parachute supply-dropping containers.

Air Strategy—XXXVIII

"NORWAY"

The Second Article on the Lessons of the Tactical Employment of Fighters and Bombers in the Present War

By CAPTAIN NORMAN MACMILLAN, M.C., A.F.C.

THE main thought which must derive from a consideration of German strategy in the Norwegian campaign is that the German conquest of Europe had long been planned, and that those in Britain who had popularly been called scaremongers before Munich (and after) were actually the persons with correct views on the true meaning of Nazi ambitions.

When I was in Norway shortly before and shortly after the accession of Hitler to the Chancellorship in Germany, it appeared to me that Norway was divided internally in politics. Political feeling was evident even between members of staffs of Government establishments. It is always difficult for a foreigner to understand the domestic politics of another nation, but it seemed to me that the political division in Norway was like a see-saw with a Liberal standing on one end of the plank and a Socialist on the other. The gulf between the two was not wide but it was deep.

There is a saying "Norway has houses and cottages but no castles." Rich people are few. Everyone shares in taxation. Among themselves the Norwegians have a reputation for stubbornness, and they love litigation.* The conditions were thus fertile for Nazi agents, and full use was made of this cruel, underhand form of race war.

The story of the implementing of German merchant vessels in Norwegian waters and then of their employment to carry German arms and troops to the Western fjords and ports need not be recounted here. At the zero hour these vessels dropped their pretence of peaceful trading and became military transports, which disgorged troops who seized the ports where they lay. Suffice to say that the initial success of the German attack on Norway was brought about by the undermining of the internal political structure by Nazi agents' propaganda, so that the Nazi standard was raised by Norwegians themselves, and by the pre-zero hour invasion of Norwegian ports by German troop transports disguised as merchantmen. Thereafter it took the Germans two months to capture the whole of Norway.

Tactical Employment

Here we are primarily interested in the tactical employment of the aircraft used in this campaign. The Germans were well aware of the naval and military resources of Norway. Probably there were few secrets anyway. Norway could entertain no aggressive intentions against any country. Her forces were small, and there was little to hide.

The semi-official German *Handbuch der Luftfahrt* for 1938 gave the strength of the Norwegian Air Service as follows:—

Army air force: 86 first line aircraft,
Naval air force: 92 first line aircraft,
Reserve about 22 aircraft,
a total of about 200 aircraft.

The same authority gave the military organisation of these aircraft as follows:—

Army Air Force:

4 Reconnaissance Squadrons,
4 Fighter Squadrons,
1 Bomber Squadron.

Naval Air Force:

4 Reconnaissance Squadrons,
4 Fighter Squadrons,
2 Light Bomber Squadrons.

This small air force was responsible for the air defence of a country 1,100 miles in length and containing a population of just under 3,000,000 people. Norway was confronted by a nation between 80,000,000 and 90,000,000 strong, and possessing the largest air force in the world.

Seizing the Aerodromes

With these facts before us it is easy to understand the German tactical employment of aircraft in the Norwegian campaign. Their first duty was to seize all usable aerodromes (landing grounds in the extreme north were under ice and snow when the German invasion began) and simultaneously destroy or capture all Norwegian aircraft.

The second duty of the German air force was to provide a means of rapid communication and swift reinforcement in a country where railway communications were few and slow and other communications uncertain so early in the year (April). Thus the German air force was used to dominate Norway where usable aerodromes existed; that meant most of the key ports and the coastal railway terminals with the exception of Bergen and Narvik.

The Norwegian railway system divides Norway into three, and this peculiarity was fully exploited by German strategy.

The southern part is the peninsula enclosed by Bergen, Stavanger, Christiansand, Oslo and the railway between Bergen and Oslo. The central part is the area lying immediately to the north and stretching as far as Trondhjem and the railway which runs thence into Sweden. Oslo and Trondhjem are interconnected by a railway line which forms a loop through the Gudbrands and Oster valleys. The northern part is the area north of Trondhjem which is not traversed by a north-south railway line, but which has a short lateral line connecting Narvik with the Swedish iron ore mines.

With the ports of Oslo, Bergen, Stavanger and Larvik all in the hands of the Germans from the first moment of the attack, and the area they enclosed dominated from the aerodromes at Oslo and Stavanger, the southern peninsula was quickly cut off, and most of the Norwegian air force was destroyed or captured at the start. Troops began to fight for the possession of the Oslo-Bergen railway.

Meanwhile, and now unimpeded, German air transports landed reinforcements of troops by air at Oslo,

*[It used to be said that one could tell the three Scandinavian nationalities by their ways of lighting cigars. The Swede would give the other man a light first, and then light his own cigar. The Dane would light his own first and then the other man's. The Norwegian would light his own cigar, and then throw the match away!—ED.]

AIR STRATEGY (Continued)

while ships brought more and more troops and supplies up the Oslo fjord. Thus was the main German base in Norway swiftly established. The British and Norwegian navies had cut the sea communications betwen Bergen and Trondhjem, while Norwegian troops guarded the railway and road communications between Oslo and Trondhjem. But for aircraft, the German force landed at Trondhjem from German vessels at zero hour would have been cut off.

The third duty of the German air force was then to reinforce the garrison at Trondhjem to enable it to hold out until it was possible for the troops in the Southern area to force a communication by land through the interlinking valleys. Aircraft were landed on frozen lakes and on temporary landing grounds as well as on the aerodrome at Trondhjem, and from them troops and supplies were disemplaned to reinforce the original force which had seized the town and its surroundings.

The fourth duty of the German air force was to assist the mechanised troops who were forcing a way up the Gudbrands and Oster valleys. Fighters, bombers and dive bombers were employed for this purpose.

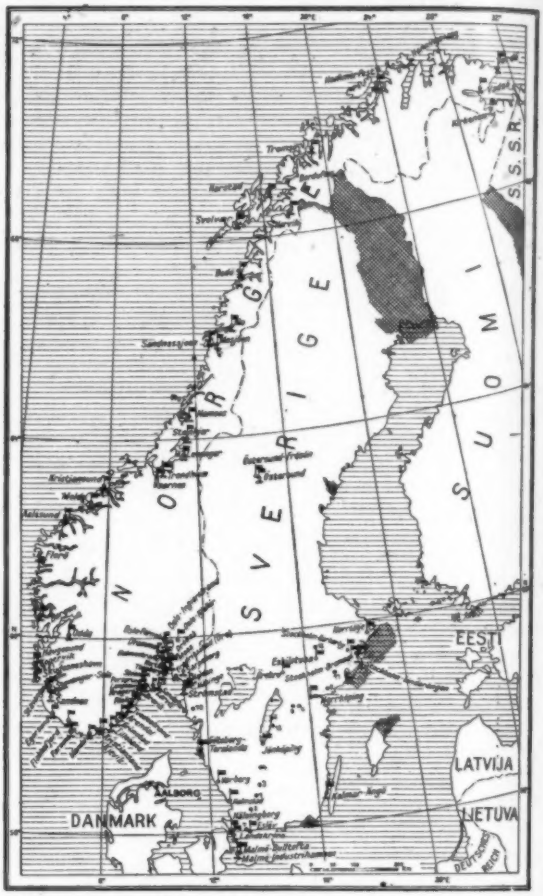
The relatively small German force which had seized Narvik at zero hour had been completely cut off by the British Navy, and its supporting ships of the German Navy in Narvik fjord had been destroyed. Again the one means of communication between the main German force and the beleaguered garrison at Narvik was by air. But at Narvik no aerodrome was available, and supplies and reinforcements in men had to be dropped by parachute.

Chain of Aerodromes

This tactical employment of aircraft was rendered comparatively easy because the Germans had a continuous chain of aerodromes from the provinces of Hanover, Schleswig-Holstein, Mecklenburg and Pomerania through Denmark and Norway to Trondhjem, and had seized the oil supplies in the two Scandinavian countries they had overrun. To operate aircraft over the route Copenhagen, Aalborg, Oslo, Trondhjem was nothing more than the Luft Hansa had done for years in all parts of Europe, except that the commercial line had used Gothenburg instead of Aalborg and had not found it worth while to proceed beyond Oslo. Perhaps it was not for nothing that Erhard Milch was appointed Secretary of State for Air under Göring when the Air Ministry was formed in Berlin in February, 1933, for Milch had been handling the operation of air lines in Europe for ten years or so before that. Anyhow, whether Milch was responsible for it or not, the German military transport air line which ran in Norway during the campaign did its job well, although it must be admitted that on the whole it had not many more difficulties to contend with than would a civil air line, and it had no limitations in personnel and aircraft.

From Oslo to Trondhjem is 250 miles, and from Trondhjem to Narvik is 400. Even without the air base at Trondhjem the Narvik garrison need not have been cut off, but it would have been more difficult for supplies and reinforcements to reach them regularly by air, and it would have been really difficult to give them air support.

After the occupation of the Southern peninsula, Trondhjem became the key to the situation in the two northern areas of Norway. And it is noteworthy that its garrison, although cut off on all sides by land and sea from support of any kind, maintained constant touch



Aerodromes and seaplane stations in Scandinavia. The first task of the Luftwaffe was to seize the Norwegian aerodromes.

with its main forces and with its outpost in Narvik by means of aircraft. The tactical employment of aircraft by the German air force in these circumstances provides a most valuable lesson, for by means of aircraft two beleaguered garrisons were maintained, while the nearer was utilised as a base for the farther one. I am not aware of any similar circumstance in war, and it would appear that aircraft alone could make such a situation possible.

Favourable Geography

Undoubtedly the geographical situation favoured the German commanders. Narvik was beyond the reach of Allied aircraft operating from any Allied base. Trondhjem lay at almost the limit of bomber operation from any Allied base; it was beyond the limit of fighter operation. The one counter air action which could be taken against the German military air transport line between Germany and Narvik was the bombing of intermediate aerodromes, including Trondhjem.

It has been proved in the present war that the bombing of aerodromes need not stop air operations for long periods, for the craters made in landing grounds and runways can be rapidly filled and the surface made good enough for taking off and landing. It is necessary to damage or destroy the aircraft to cause a serious interruption in air operations. With the tremendous preponderance of aircraft possessed by Germany for the Norwegian campaign, even the damage or destruction

AIR STRATEGY (Continued)

of aircraft on the scale which was possible in view of the distance of the Norwegian aerodromes (except Stavanger) from British bases could not greatly affect the efficiency of the German air communications.

The lesson which appears to be indicated here is that the bomber is not a good weapon to employ against a line of air communications. In such circumstances its value as a weapon may be thrown away. The bomber should be directed against main bases, base stores, ports of embarkation and disembarkation—in fact, all points of concentration of effort, including troop concentrations even in the front line.

The next duty of the German air force in Norway was to employ their bombers against just those very targets which it was impossible for the Allies to attack on the German side. Allied troops had landed in the fjords between Bergen and Trondhjem, and the forward lines had moved up the valleys to intercept the German advance on Trondhjem along the Gudbrands valley. The Allied force arrived in the Gudbrands valley in time to intercept the German forces, but there they found themselves attacked by enemy aircraft without having any air defence except their ground equipment. The German bombing forces simultaneously concentrated upon the Allied base ports in the fjords, destroyed the towns and smashed up the jetties. It was at this period that a British Gladiator squadron landed on a frozen lake in the attempt to hold up the German bombers. The squadron's aircraft were bombed out of action within 48 hours. The Allied forces in Central Norway had to be withdrawn the way they had come, because German bombing pressure was too heavy.

British and German Tactics

In this we see the converse of the British bombing of line of communication aerodromes in German hands in the two Scandinavian countries. The German bombing was directed against Allied concentrations, including their sole concentration of aircraft. Admittedly the odds were unequal, but it would appear that the method of the tactical employment of air power was at fault on the Allied side.

The Allies had the opportunity to bomb the German forces when they were concentrating in Baltic ports prior to the attack on Norway. This opportunity was missed, but for what reason it was missed it may not be possible to learn until after the war, when it becomes possible for a full history of the momentous events of this war to be written by both sides. Once the force had dispersed throughout Denmark and Norway it became an impossible proposition for the Allies to carry out effective air attacks from the far-distant bases they possessed.

It would also appear that the failure to attempt the recapture of Trondhjem by direct instead of indirect methods was the Allies' principal strategic misconception of the whole campaign—that is, after their initial failure to stop the surprise seizure of all the key ports. That initial failure was a flop for the intelligence departments, unless there is more in the story than appears on the surface; again we shall have to wait until the war ends.

The withdrawal of the Allied force from Central Norway marked the beginning of the last phase of this campaign. The way into Narvik had been kept open by Allied naval ships, most of them British. Narvik was the all-year-round port of shipment of Swedish iron ore. Whoever possessed Narvik possessed at least part of the iron ore supply of Sweden, unless, of course, Germany had occupied Sweden. A British expeditionary force went to Narvik. All three Services were under naval control. Narvik was captured. The shore-based aircraft did good work, but there was still a failure to provide the bombing punch which was needed to deal with the enemy.

Concentrated Targets

And while that effort within the Arctic Circle drew to its early close, the great struggle on the Western front had begun. The German squadrons had been faced about, their blows fell first and hardest on Holland. The German air force again struck at the heart of concentrations of troops and people and cities, while in the Far North the little expeditionary force of the Allies struck at a shadow by comparison. The importance of Narvik had gone. But still the Germans reinforced the German troops by air, and dropped supplies. In the face of what must have been an unfathomable situation the Allied expeditionary force withdrew from Narvik, and the brief Norwegian campaign was ended.

The lesson to be learned from that campaign is not only that air superiority, in numbers, in striking range, and in lines of communication, must be matched or bettered, but that when bombers are tactically employed they must be directed against concentrated targets. Once the targets are dispersed the whole air effort is dispersed, too. Moreover, air lines of communication, once established, need fighters, not bombers, to break them efficiently; air victory is won by destroying aircraft at any point, from the destruction of the raw materials of which they are made to the finished article in flight, and that includes their fuel and their oil also.

(Next week: Low Countries and France.)

THE CANADIAN WAR EFFORT

CANADA'S High Commissioner, Mr. Vincent Massey, when he spoke at a luncheon given by the National Defence Public Interest Committee on January 22, gave a stirring account of what Canada was now doing for the prosecution of the war, and of the close relationship which exists between the Dominion and the Mother Country. Though agriculture was still the foundation of the country, the value of the products from factories had now been made to exceed farm products, such was the magnitude of the industrial effort. In the military field the Army was the largest of the three forces, but the Navy, though not large, had increased its personnel by eight times and its number of ships by ten times since the outbreak of war. The Empire Air Training Plan was well ahead of schedule, for instead of 33 training schools due to be operating last month there were 48. All the buildings and aerodromes due for completion in 1941 had been finished last year.

The great diversity of the Canadian manufacturing plant was shown in the products being made or about to be made. These included airframes, 3.7 in. anti-aircraft guns, 25-pounders, anti-tank guns, 4 in. and 6 in. naval guns, machine guns, tanks, trucks, rifles, explosives, shells, naval craft, and optical and other precision instruments. To accelerate production eight Government-owned factories had been set up for the production of aircraft. Canada, said Mr. Massey, is now "full out" in her war programme.

THE AIRCRAFT ENGINEER

No. 179. 16th Year.

AIRSCREW BALANCING

A Simple Survey of a Little-understood Subject

By J. LOCKWOOD TAYLOR, D.Sc.

IN the old days of integral fixed-pitch airscrews, balancing was a comparatively simple matter. All that was necessary was to test the airscrew for static balance on knife edges in the usual manner. No attempt was made to get dynamic balance, which would have involved spinning the propeller and would, in fact, have been rather difficult in view of the power required to spin it at a sufficiently high speed, and the complication of the effects of thrust and slipstream. In the case of the modern variable-pitch airscrew with detachable blades, however, the position is rather different. Each blade must be balanced separately about all three axes, within a specified tolerance, in order to ensure static balance of the complete airscrew when assembled. A certain degree of dynamic balance also results from this procedure, since the fore-and-aft position of the individual blade c.g.s is controlled.

It is of interest to consider the relation between the tolerance allowed on the individual blades and the resulting degree of accuracy of balance of the airscrew as a whole. Superficially, if a tolerance of, say, 5 in./oz. is allowed on each blade of a two-bladed airscrew, the maximum possible out-of-balance for the whole propeller is 10 in./oz. Actually it is somewhat greater, when account is taken of the fact that the blade c.g.s can move slightly in the circumferential direction as well as radially along the blade axis. Assuming the same tolerances in inch-ounces in the two directions (this is, in effect, a rather more severe standard for the radial balance, although it is the usual practice), it is possible to have 10 in./oz. out-of-balance in two directions at right angles, which combine to give a resultant at 45 deg. of about 14 in./oz. Such a result would, of course, only occur as a consequence of the most unfavourable combination of circumstances possible.

Similarly for an airscrew having more than two blades, e.g., a four-blader. The worst possible combination of radial out-of-balance is 10 in./oz. from each pair of opposed blades, which, by vector addition, gives a total of 14 in./oz. Adding the possible circumferential out-of-balance, of similar amount, in the same direction makes 28 in./oz. in all.

The Three-blader

The case of the three-blader, as commonly used, is a little more difficult to work out, but it is easily seen that it is intermediate, as regards balance, between the two- and four-blader. Actually, the worst combination gives a slightly smaller moment, averaged per blade, than for either. The apparently large total tolerances evaluated for multi-blade propellers should, perhaps, not be regarded in too serious a light, since the combination of circumstances assumed is even more improbable than in the case of the two-blader. Further, they are based on the assumption that blades are all balanced separately, and selected at random in making up the complete sets for assembly. By balancing in sets the likelihood of a large total out-of-balance for the finished airscrew can be largely eliminated.

The magnitude of the actual unbalanced forces corresponding with a given tolerance on the static balance depends, of course, on the airscrew r.p.m. Thus 5 in./oz. at 1,500 r.p.m. gives approximately 20 lb. unbalanced force. This applies to radial out-of-balance, and also, as may readily be seen, to circumferential out-of-balance. In the latter case the resultant centrifugal force is, for all practical purposes, unaffected, but its line of action is moved through a small angle due to the force of 20 lb. acting at right angles in the plane of rotation.

Static Two-axis Balance

Two only of the three balancing axes for the individual blades are concerned in the static balance of the complete airscrew. Balance about the third axis influences the dynamic balance, but the conversion of the moment tolerance about this axis, corresponding with movement of the blade c.g. perpendicular to the plane of rotation into unbalanced moment, is less definite than in the case of the other axes. A departure from the standard moment amounting to 5 in./oz. may be due, for instance, to a transfer of material weighing 5 oz. through a distance of one inch, and the same moment is recorded whether this transfer takes place at the root or at the tip of the blade. The corresponding transfer of centrifugal force will differ widely, however, so that the moment tolerance cannot be converted directly into unbalanced moment.

Assuming the out-of-balance to be evenly distributed over the blade, the unbalanced moment is found to be equal to 20 lb. multiplied by the distance of the blade c.g. from the shaft axis. The combination of the unbalanced moments of the different blades follows the same lines as for the radial out-of-balance forces. There is no counterpart of the circumferential out-of-balance forces, unless possible variations in the centrifugal twisting moments of the blades are so regarded. There is no check on this possibility in the process of manufacture, but the likely amount of variation is small. Whilst it is difficult to make an exact comparison of the effects of forces and moments in producing vibration in the aircraft, it is probable that the effect of a moment of the amount mentioned is comparable with that of a force of 20 lb., so that from this point of view the standard of dynamic balance realised is reasonably in accordance with the static balance.

For a variable-pitch airscrew, balance is required over a range of pitch settings which may amount to 20 deg. or more. A common practice is to balance at 0 and 90 deg., and, whilst this may be a convenient procedure and may facilitate the choice of positions for the removal or addition of material to secure balance, it is fairly easy to see that it does not necessarily ensure that the nominal tolerance will apply to the pitch settings in actual service. In an unfavourable case a tolerance of 5 in./oz. at both 0 and 90 deg. may mean 7 in./oz. at 45 deg. setting, in either the circumferential or axial direction. Radial balance is not affected, but a closer approximation to balance in the other directions would probably be got by balancing about three axes at the mean service pitch setting, between

AIRSCREW BALANCING (Continued)

take-off and top speed. The fully feathered condition hardly enters into the question, as the r.p.m. will then be low.

No mention has been made of aerodynamic balance; this is no less important than balance of the centrifugal forces, and it is normally ensured by the inspection of the sections of the finished blade. Pitch is particularly important, since the pitch variation from blade to blade required to give 20 lb. variation in the torque force, regarding this as the acceptable tolerance, is only of the order of ¼ deg. for a 1,000 h.p. airscrew at top speed. Thrust variation does not affect the balance, but is objectionable as producing bending of the airscrew shaft.

One or two details of balancing practice are, perhaps, worthy of mention. There is a definite advantage in using a dummy master blade which may be made of any convenient material not liable to damage or deterioration, instead of an actual blade, and the position and alignment of the balancing axis need not then be highly accurate since all the blades are balanced under precisely similar conditions and are therefore bound to be similar. The use of two balancing spindles at right angles saves time in rotating the blade in the hub to vary the pitch setting. Special balancing machines have been developed which weigh the blade moment about the various axes and thus give a direct reading of the amount of departure from the standard figure. The actual blade weight, as distinct from the moment about the axis, is, incidentally, of minor importance, provided the moment is correct, although the weights are not, of course, likely to vary by appreciable amounts for blades which are otherwise balanced to the same master.

THE "BOTHA" I

First Details of Blackburn General Reconnaissance and Torpedo Bomber

THE Blackburn "Botha" I, a general-purpose torpedo bomber, is a twin-engined, high-wing, cantilever monoplane. The engines are Bristol "Perseus" Mark XA sleeve-valve radials, carried in nacelles formed below the main plane. The machine is of all-metal construction (with the exception of fabric covering on some of the control surfaces) and carries a crew of four. The fuselage is a monocoque structure, flush-riveted construction being employed throughout. An enclosed cabin houses the crew, consisting of pilot, navigator/bomb aimer, wireless operator and gunner; a gangway extends along the starboard side of the cabin, permitting intercommunication between forward and rear positions. Access to the cabin and pilot's seat is through a large door on the starboard side.

The pilot's seat is situated to the port side of the forward end of the cabin, the bomb aimer's prone position being to the starboard side.

The main plane is composed of three principal sections, the centre section, which carries the engine nacelles, and the two outer sections. The centre section is parallel in plan, while the outer sections taper considerably towards the tips, which are rounded.

Balanced ailerons extend along a portion of the trailing edges of the outer sections, and flaps along the trailing edges of the centre section. The flaps are hydraulically operated and may be used to improve take-off and to limit landing speed.

The centre plane carries the two engine mountings and the undercarriage units, and also houses the main fuel and oil tanks.

Both fin and tailplane are unbraced cantilevers of stressed-skin metal construction; the rudder and elevators are of metal construction but are fabric covered. The tailplane is placed to the rear of the vertical fin; the leading edges of the plane sweep back slightly towards the tips, the trailing edges of the elevators forming a straight line. The leading edge of the vertical fin slopes to the rear, while the trailing edge of the rudder is vertical. Tips of tailplane and rudder are well rounded. Rudder and elevators are balanced by a combination of inset hinge and horn balance, and trimming tabs are fitted.

The landing gear consists of separate retractable oleo-pneumatic legs carried beneath the engine nacelles and retracting into them. When the wheels are raised hydraulically, mechanically-operated doors close beneath the legs and give a smooth under surface to the nacelles. Retraction is effected by hydraulic rams, "nutcracker" type rear struts being fitted; hydraulically-operated brakes are fitted to the wheels.

The tail wheel is mounted on an oleo-pneumatic shock-absorber strut, with caster action and friction dampers.

The two radial engines are fitted with leading edge exhaust collector rings and are enclosed in deep-chord fairings with controllable cooling gills. Three-bladed, constant speed, controllable pitch airscrews are fitted. The rear portions of the engine nacelles, which are detachable, are mounted below the centre plane, and house the retractable undercarriage units.

A power-operated multi-gun turret is situated on the fuselage to the rear of the main plane trailing edge. Access to it is gained from the rear of the cabin.

The equipment of the "Botha" for marine work includes a collapsible dinghy, with inflation bottle, markers, floats, etc., in addition to the complete equipment of wireless and electrical gear.

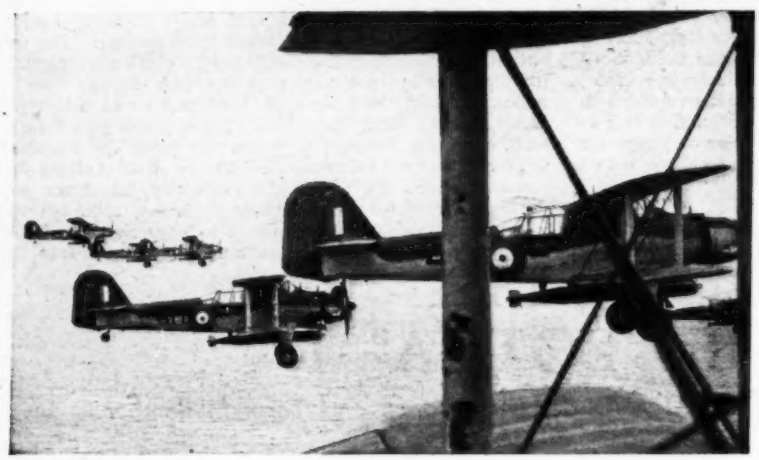
OVERALL DIMENSIONS.

Span	59ft. 0in.
Length overall	51ft. 1⅛in.
Height overall	14ft. 7⅝in.

The Blackburn Botha has Bristol Perseus sleeve-valve engines.

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements



ITALIAN NIGHTMARE : A formation of Taurus-engined Fairey Albacores with torpedoes aboard.

London Women Drivers

THERE is room in the Women's Auxiliary Air Force for a limited number of experienced women drivers with a good knowledge of the London district to drive R.A.F. staff cars. Candidates will be accepted between the ages of 18 and 43, or up to 50 in the case of ex-Service women. Only those with clean licences will be accepted.

Those who think of taking advantage of it should make early application to the W.A.A.F Recruiting Depot, Victory House, Kingsway.

Emir Appointed Air Commodore

A BRILLIANT ceremony took place at the Royal Air Force Station at Amman, Transjordan, when His Highness the Emir Abdullah attended a ceremonial parade to celebrate his appointment as an Air Commodore of the Royal Air Force. His Highness was in R.A.F. uniform. The Emir is brother of King Feisal and the senior living Prince of the Hashimite family, who served with the British in the war of 1914-1918. Transjordan and R.A.F. flags flew side by side at the parade, and the khaki and red uniforms of the band of the Arab Legion and the blue of the R.A.F. made a gay setting.

The personal pennant of an Air Commodore was handed to the Emir by the Officer Commanding the R.A.F. Station, and when the Emir had expressed his thanks, his standard was broken at the mast-head. The parade gave the Royal Salute and advanced in review order. First came the airmen, then an impressive drive past of armoured cars, and a fly past of aircraft. The officers were presented to the Emir, who expressed his great pride at "becoming a member of the Royal Air Force, and thus rejoining the British fighting Forces."

Civilian Wireless Training

FOR some time, men trained at certain civilian wireless schools have been accepted for the Royal Air Force as wireless operators. This scheme is now to be extended. Civil wireless schools administered by the General Post Office and municipal technical colleges are to give courses in wireless to boys who intend to enlist. Boys so trained will be accepted for the Royal Air Force as wireless operators from the age of 17½, if suitable. In such cases a return of tuition fees can be claimed up to £25.

Service Air Mail

THE special arrangements which were made during Christmas for members of British Forces in the Middle East to send air mail letters without payment proved highly popular with the troops. "Clare," one of Britain's famous trans-Atlantic flying-boats, brought 735lb. of air mail letters to England in time for distribution all over the United Kingdom.

Prisoners of War

NEXT of kin, if able to identify the men from the information published, are requested to advise the Casualty Branches of the Services concerned, forwarding regimental or any other details.

The following is the latest list of British prisoners of war as received from enemy sources:—

In German hands:—

F/O. B. W. Perryman, Post Box 1, Lincoln, Canterbury, New Zealand.

F/O. B. E. Jones, Margaretta Terrace, London.

Sgt. W. G. Whiskart Younger (?), Birkett (?), Newer (?) or Muir (?), Park Kinross.

Meteorological Assistants

BOYS of 17 who have taken a general schools certificate (or its equivalent) now have a chance to work in a new field with the R.A.F. if their certificate included credits in mathematics and physics. Owing to the growth of the R.A.F., the Meteorological Office of the Air Ministry need urgently a large number of meteorological assistants between 17 and 18 years of age. Experience has shown that schoolboys with the right qualifications can adequately fill these key posts at R.A.F. stations after they have had a short training course.

Their primary work will consist of preparing the weather charts from which forecasts are made for R.A.F. pilots and air crews. This will be partly based on personal observations of local weather conditions, including the measurement of wind at high altitudes. The pay is £110 per annum on entry, rising to £125 at 20 years of age. Civil Service war bonus is also given.

Applications should be made to the Air Ministry, Information Bureau, Kingsway, London, W.C.2, and should be marked "Met. Assistant."

Selection boards will shortly be held in London, Edinburgh, Manchester, Nottingham and Gloucester. Boards will also visit other towns where there is a sufficient number of candidates.

Awards

THE KING has been graciously pleased to approve the following awards, in recognition of gallantry in flying operations against the enemy:—

DISTINGUISHED FLYING CROSS.

F/O. P. H. WATTS.—In January, 1941, this officer carried out a most successful reconnaissance of Brest in the face of intense anti-aircraft fire. F/O. Watts has completed at least 45 operational missions and, by his keenness, thoroughness in preparation, and determination, has always obtained excellent results.

P/O. J. DICKINSON, R.A.F.V.R., No. 110 Squadron. (See citation below.)

DISTINGUISHED FLYING MEDAL.

Sgt. G. G. THOMPSON, R.A.F.V.R., No. 110 Squadron.—P/O. Dickinson and Sgt. Thompson were the pilot and air gunner respectively of an aircraft detailed to attack a target at Gelsenkirchen. Owing to adverse weather conditions they were unable to locate their primary objective but successfully bombed a factory at Reckinghausen as an alternative.

After passing Eindhoven, on the return journey, an illuminated dummy flare path was observed. P/O. Dickinson thereupon altered course for Gilze-Rijan aerodrome, where two hostile aircraft, showing navigation lights, were seen flying in a westerly direction. Pursuing one of these for about 30 miles, P/O. Dickinson skilfully manœuvred his aircraft and enabled Sgt. Thompson to engage and eventually shoot down the enemy. P/O. Dickinson and Sgt. Thompson showed great courage and initiative throughout the operation.

ORDER OF THE BRITISH EMPIRE (MILITARY DIVISION).

F/O. J. H. LAUGHLIN.

P/O. J. COGGINS.

In September, 1940, an aircraft carrying a full load of bombs, crashed among other aircraft and burst into flames. F/O. Laughlin, P/O. Coggins, and another officer immediately ran to these aircraft, started the engines and taxied them away. During this time two bombs on the burning plane had exploded. The action showed complete disregard for personal safety, in the face of the greatest danger, and owing to the officers' promptness three aircraft were taken to safety without damage and a fourth with only minor damage.

ORDER OF THE BRITISH EMPIRE, FOR MERITORIOUS SERVICE (MILITARY DIVISION).

Sgt. F. J. BLACKWOOD.—This airman has displayed courage of a high order in ten successive raids and has energetically assisted in raising the morale of the station by his example.

Cpl. J. G. M. DAVIS.

A/C.1 T. MCCANN.

During September, 1940, these airmen approached a burning aircraft and succeeded in de-

ON A SPECIAL MISSION : Air Chief Marshal Sir Hugh Dowding welcomed on arrival at Ottawa. Left to right : Air Commodore G. O. Johnson, Air Chief Marshal Sir Hugh Dowding, Air Commodore H. Edwards and Air Vice-Marshal L. Dalzell-McKean.

SERVICE AVIATION (Continued)

taching Vickers guns and magazines of ammunition and removing them to a place of safety. Both displayed conspicuous gallantry in disregarding imminent personal danger from exploding ammunition and the likelihood that the petrol tanks might explode.

Cpl. H. SPENCER.
A/C.2 S. WARD.

During a night in September, 1940, these airmen were members of the fire tender crew on duty when an aircraft crashed on taking off and burst into flames. Though fully aware that the aircraft was carrying a full load of bombs and ammunition, Cpl. Spencer rushed into the fire and endeavoured to extricate the injured observer who was lying under the port wing.

A/C Ward, also knowing the aircraft was loaded, went to his assistance, and they were able to carry the injured man to safety. Cpl. Spencer then returned to the fire in an attempt to rescue other members of the crew. One of the two 250lb. bombs exploded and threw him to the ground ten yards away but without causing him serious injury. Both these airmen displayed a complete disregard for their personal safety, and the injured observer undoubtedly owes his life to their gallantry.

GEORGE CROSS.

Wing Cdr. L. F. SINCLAIR, D.S.O.—During a night in September, 1940, an aircraft burst into flames while taking off. Wing Cdr. Sinclair immediately went to the scene to render assistance, but two 250lb. bombs exploded before he reached it. Undeterred, and knowing that two more bombs were in the aircraft, he pressed on, and dashing into the fire he succeeded in dragging the air gunner to a safe distance. In this act this officer displayed the most complete disregard for his own safety. Unfortunately the rescued air gunner has since died of his injuries.

Act. Flt. Lt. W. H. CHARLTON.—Flt. Lt. Charlton is responsible for all work in connection with enemy bombs in an area comprising the greater part of two counties. Both by day and night, during recent months, he has dealt with some 200 unexploded bombs. The manner in which this Flight Lieutenant carried out his extremely dangerous duties called for personal courage of an exceptional order. Flt. Lt. Charlton has successfully undertaken many dangerous missions with undaunted and unfailing courage.

A/C.1 V. HOLLOWDAY.—One night in July, 1940, when returning to camp, this airman observed an aircraft crash and burst into flames near Cranfield Village. He immediately proceeded to the wreckage and made his way through the burning debris which was scattered over a wide area by the force of the impact. He found the pilot whose clothing was on fire, and put out the flames with his bare hands. Had the pilot not been killed instantly in the crash this action would, in all probability, have saved his life.

During August, 1940, this airman was again returning through Cranfield to the camp when an aircraft suddenly spun to the ground and exploded. He immediately went to the crash and a second explosion occurred. Ammunition was exploding all the time, but, despite this, he borrowed a gas mask, wrapped two sacks over himself and spent some time in the flames, making four attempts before he succeeded in releasing the first occupant. He then re-entered the burning wreckage and successfully removed the second. All three occupants, however, were already dead. A/C Hollowday displayed amazing courage and initiative on both occasions.

GEORGE MEDAL.

P/O. J. J. P. DUDLEY, R.A.F.V.R.—One morning in October, 1940, a hangar had been badly damaged by incendiary bombs. Although he knew that there were unexploded bombs in the hangar, Pilot Officer Dudley led the fire fighting party with such skill and gallantry that the fire was prevented from spreading and three aircraft were saved.

When this station was again attacked one evening later in the month, he rallied the fire fighters, removed an aircraft from a burning Bessoneau, and then fought the fire, which he brought under control with amazing speed.

W/O. E. G. ALFORD.—This warrant officer has displayed great gallantry and skill in disposing of a large number of unexploded bombs, never hesitating to deal with them immediately if he considered their presence was affecting the operational efficiency of the station.

W/O. E. G. HUNT.—This warrant officer has dealt with unexploded bombs after six enemy bombing attacks on the aerodrome. On one occasion, while assisting an officer he was blown 20 yards, but in spite of this he has continued to show a complete disregard for his own safety and his gallant actions have been instrumental in keeping the aerodrome operationally serviceable.

W/O. J. V. SAUNDERS.—This warrant officer has been in charge of parties dealing with the many unexploded bombs which have fallen on the aerodrome. He has carried out his duties often in very difficult circumstances, and has shown high courage and devotion to duty.

Sgt. D. F. ALLEN, R.A.F.V.R.—In September, 1940, this airman was the turret gunner of an aircraft which crashed in dense mist; he was dazed by a heavy blow on the head and his parachute harness was entangled with the seat. Although the compartment door was jammed, Sgt. Allen succeeded in forcing his way out of the wreckage, and, in spite of the fact that the aircraft was on fire, he proceeded with great energy and resolution to extricate the unconscious bodies of three of the crew at the risk of his own life.

Undeterred by the increasing intensity of the heat and fumes from the burning wreckage, and amid exploding ammunition, he then endeavoured to find the pilot, but was unsuccessful. Unaware, owing to the dense mist, that the crash had occurred on the aerodrome, Sgt. Allen removed the unconscious men to a safe distance from the flames before assistance arrived. It was due to his efforts that the three members of the crew were not burnt with the aircraft, though, unfortunately, they subsequently died from injuries sustained during the crash.

Sgt. K. LYTHGOE.
A/C.2 R. NICHOLSON.
A/C.2 A. SIMPSON.

These airmen, as members of a demolition party, handled enemy bombs with great courage and disregard for their personal safety, on various dates during July, August and September, 1940.

L.A/C. R. J. FARLEY.
A/C.1 T. W. COOP.

In September, 1940, an aircraft crashed on an aerodrome and immediately burst into flames. A/C. Coop promptly ran to the burning aircraft and endeavoured to extricate the pilot. In spite of the flames, and regardless of the additional danger from exploding ammunition, L.A/C. Farley unhesitatingly ran to his assistance and, plunging his arms into the blazing cockpit, released the legs of the pilot, who was apparently stunned and whose clothes were in flames.

Between them the airmen carried him to a safe distance, thereby saving him from certain death. In spite of superficial burns on arms and legs, L.A/C. Farley returned to his normal duties. By their action these two airmen showed great courage and complete disregard for their personal safety. Unfortunately, the pilot later succumbed to his injuries.

L.A/C. R. S. PRIOR.—In August, 1940, this airman, while on leave in London, showed conspicuous bravery by entering an aircraft which had crashed and caught fire in a street of houses after the pilot had descended by parachute. One gun was firing to the danger of the people in the vicinity, and ammunition in the aircraft was exploding. Despite the danger of the petrol tank exploding at any moment and the fact that he sustained burns to his hands and arms in the process, which necessitated subsequent medical attention, L.A/C. Prior succeeded in gaining access to the gun and removing the back plate in an endeavour to arrest the continued functioning of the gun.

At a Fighter Station: The King decorating Flt. Sgt. B. H. Hornded with the B.E.M.

London Gazette
Royal Air Force

General Duties Branch.

Flt. Lt. (Temp. Sqn. Ldr.) A. J. F. Churchill is granted a permanent commission in the substantive rank of Flight Lieutenant (Oct. 19, 1940).

The undermentioned are granted commissions for the duration of hostilities:—As Pilot Officers on probation: Flight Sergeant: (Dec. 7, 1940) A. G. Williams; (Dec. 14, 1940, Sen. April 25, 1940) F. W. Cook; (Dec. 16, 1940) O. H. Archer. Temporary Flight Sergeant: (Sept. 28, 1940) A. F. Laws, D.F.M. Sergeants: (Dec 6, 1940) R. R. Mitchell; (Dec. 20, 1940) H. E. Aspey, W. H. Hanningan, F. W. Holden.

P/O. on probation F. B. Burningham is confirmed in his appointment (Mar. 6, 1940).

P/O. on probation D. D. Haig is confirmed in his appointment and promoted to the rank of Flying Officer (Dec. 23, 1940).

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Sept. 3, 1940) A. T. E. Fitt, M.B.E. (ret.), A. Deakin (ret.), G. H. B. Hutchinson, G. V. W. Davies, J. G. P. Greenwood, R. H. Balls; (Oct. 26, 1940) B. West (ret.); (Nov. 5, 1940) R. C. Bissett, D.F.C., J. R. Taylor; (Nov. 10, 1940) R. E. Craven, D.F.C., J. M. Littler, R. F. Aitken; (Nov. 11, 1940) J. F. Mackie; (Dec. 10, 1940) V. T. L. Wood, D. Clyde-Smith, M. T. G. Henry, D.F.C., T. L. Bingham-Hall; (Dec. 11, 1940) E. Smith (ret.); (Dec. 18, 1940) D. Gibson; (Dec. 24, 1940) R. D. Davis, D. G. Ogilvie, G. Robinson, T. H. B. Tayler; (Jan. 3, 1941, Sen. Jan. 3, 1940) E. H. L. Webber (Lt. Somerset L.I.); (Jan. 11, 1941, Sen. Jan. 11, 1940) J. R. Davenport (Lt., R.A.).

The undermentioned Pilot Officers are promoted to the rank of Flying Officer:—(Sept. 3, 1940) M. K. Holland; (Nov. 6, 1940) J. Redman, V. B. Verity; (Nov. 18, 1940) F. B. Burningham, J. H. Edwards, J. H. Godwin, E. Walker; (Dec. 9, 1940) D. R. W. Brooks, C. V. Fraser, D.F.C., P. Nixey, E. Trumper, A. T. Wheatley; (Dec. 16, 1940) B. J. Hooper, G. H. Russell, D.F.C., T. A. Hampton, (Jan. 6, 1941) B. Smith; (Jan. 2, 1941) N. W. Walders.

The undermentioned Flying Officers are granted the war substantive rank of Flight Lieutenant:—(Dec. 3, 1939) M. W. Nolan (ret.), C. Scragg, M.B.E.; (Feb. 16, 1940) P. G. St. G. O'Brien; (Feb. 23, 1940) R. S. Allen, D.F.C. (substituted for notification of Oct. 8, 1940); (Feb. 24, 1940) A. O. Bridgman, D.F.C. (substituted for notification of Oct. 8, 1940); (Feb 27, 1940) D. C. F. Good, D.F.C.; (Mar. 2, 1940) F. F. Hewitt (ret.); (Mar. 26, 1940) T. C. Weir; (April 5, 1940) S. T. Meares; (April 18, 1940) A. J. Banham (substituted for notification of Oct. 8, 1940); (May 14, 1940) D. D. Rogers; (July 9, 1940) G. F. Rodney, A.F.C.; (Aug. 10, 1940) A. G. Wincott; (Sept. 24, 1940) D. R. S. Bader, D.S.O., D.F.C. (ret.); (Nov. 1, 1940) J. C. Gates.

F/O. R. D. C. Gibson, D.F.C., is granted the war substantive rank of Flight Lieutenant (Dec. 16, 1939) (Substituted for notification of May 14, 1940).

F/O. J. A. Roncoroni is granted the war substantive rank of Flight Lieutenant (June 11, 1940) (substituted for notification of Oct. 8, 1940).

F/O. A. H. Smythe is granted the war substantive rank of Flight Lieutenant (Mar. 14, 1940) (substituted for notification of June 11, 1940.

F/O. P. D'A. Lister is granted the war substantive rank of Flight Lieutenant (Aug. 10., 1940) (substituted for notification of Oct. 22, 1940).

F/O. W. B. Wight is granted the war substantive rank of Flight Lieutenant (Aug. 16, 1940) (substituted for notification of Nov. 5, 1940).

F/O. H. P. Pleasance, D.F.C., is granted the war substantive rank of Flight Lieutenant (Sept. 1, 1940) (substituted for notification of Sept. 27, 1940).

The undermentioned Pilot Officers are granted the war substantive rank of Flying Officer:—(Dec. 3, 1939) W. S. Moore (substituted for notification of Dec. 26, 1939); S. P. V. Bird (substituted for notification of Jan. 9, 1940); N. A. Edwards (substituted for notification of Mar. 19, 1940); D. H. Mackay (substituted for notification of June 11, 1940); R. Herrick; (Dec. 6, 1939) H. C. Bailey (substituted for notification of Feb. 20, 1940); D. M. Barker (substituted for notification of Feb. 20, 1940); W. R. Farnes (substituted for notification of April 30, 1940), R. Thomas, D.F.C. (substituted for notification of May 21, 1940), A. E. Bull (substituted for notification of Nov. 5, 1940); (Jan. 14, 1940) I. L. B. Aitkens (substituted for notification of Oct. 8, 1940); (Jan. 17, 1940) P. E. Lewis; (Jan. 23, 1940) E. L. Frith; (Feb. 9, 1940) D. M. Taylor (substituted for notification of Feb. 20, 1940); (Mar. 3, 1940) R. G. Maddox (substituted for notification of June 11, 1940), I. Macleod-Selkirk (substituted for notification of Oct. 8, 1940); (May 1, 1940) H. G. Hastings, A.F.C., A.F.M.; (May 24, 1940) C. Marshall; (June 4, 1940) D. W. Gathercole; (July 15, 1940) N. J. Mowat; (Aug. 10, 1940) E. M. Pain (substituted for notification of Sept. 20, 1940); (Aug. 12, 1940) J. Barraclough (substituted for notification of Oct. 29, 1940); (Aug. 15, 1940) R. C. Wilkinson; (Aug. 16, 1940) E. H. Whitehouse; (Aug. 20, 1940) M. M. Stephens, D.F.C.; (Oct. 24, 1940) O. J. O'Brien; (Nov. 1, 1940) C. V. Haines; (Nov. 24, 1940) J. E. Proctor.

F/O. N. E. H. Virgin takes rank and precedence as if his appointment as Flying Officer bore date Dec. 3, 1940. Reduction to take effect from Dec. 9, 1940.

The undermentioned resign their commissions:—(Dec. 23, 1940) P/O. H. F. Mitchinson; (Jan. 5, 1941) Sqn. Ldr. S. P. Langston.

Erratum.

In notification of Nov. 5, 1940, concerning M. M. Wallen-Stein. *For* Wallen-Stein *read* Wallenstein.

Technical Branch.

The undermentioned are granted commissions for the duration of hostilities.—As Flying Officers on probation:—Warrant Officers: (Nov. 22, 1940) E. Wood; (Dec. 4, 1940, Sen. Sept. 2, 1940) T. E. Pavitt. As Pilot Officers on probation:—Act. Warrant Officer: (Dec. 16, 1940) C. T. Fallaca. Flight Sergeants: (Dec. 20, 1940) R. T. Townson; (Dec. 22, 1940) S. Holdsworth; (Dec. 23, 1940) R. T. W. Evans. Sergeants: (Nov. 15, 1940) K. H. Dring; (Dec. 4, 1940) J. L. Whitford; (Dec. 19, 1940) R. W. Penny; (Dec. 24, 1940) E. J. Fisk.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenants:—(Aug. 23, 1940) S. Mather; (Aug. 30, 1940) W. Jenkins; (Sept. 30, 1940) H. R. Evans; (Oct. 4, 1940) F. Kirchey, T. E. Bond; (Nov. 16, 1940, Sen. Aug. 23, 1940) C. H. Spry.

The undermentioned Flying Officers are granted the war substantive rank of Flight Lieutenant:—(Dec. 3, 1939) H. Furner (substituted for notification of Oct. 8, 1940); (Mar. 3, 1940) L. H. Rose; (Mar. 6, 1940) C. H. Wilson; (April 16, 1940) G. G. Meager, M.B.E.; (July 11, 1940) T. A. Scarff; (Aug. 25, 1940) T. U. Pollitt; (Aug. 28, 1940) C. C. Howes; (Sept. 1, 1940) A. E. Pearce;

SERVICE AVIATION (Continued)

(Sept. 15, 1940) F. C. Steadman; (Oct. 10, 1940) W. G. Lawrence; (Oct. 12, 1940) C. Hartley; (Oct. 17, 1940) J. Baishaw; (Nov. 6, 1940) E. S. Leary; (Nov. 21, 1940) A. H. King; (Nov. 28, 1940) C. D. Connerton; (Nov. 30, 1940) A. J. Whiting.

P/O. C. E. Bicknell is granted the war substantive rank of Flying Officer (Nov. 14, 1940).

Administrative and Special Duties Branch.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—Warrant Officer: (Dec. 3, 1940) R. S. Blackman. Flight Sergeants: (Dec. 8, 1940) N. Wilson; (Dec. 14, 1940) S. A. Vialls. Sergeant: (Dec. 1, 1940) F. L. Payne.

P/O. on probation A. E. Bibb is promoted to the rank of Flying Officer on probation (Sept. 18, 1940).

P/O. E. Hills is granted the war substantive rank of Flying Officer (Oct. 31, 1940).

Equipment Branch.

C. C. G. True is granted a commission for the duration of hostilities as Pilot Officer on probation (Dec. 19, 1940).

P/O. on probation B. McA. Hodge is confirmed in his appointment and promoted to the rank of Flying Officer (Sept. 6. 1940).

The undermentioned P/O. on probation are granted the war substantive rank of Flying Officer on the dates stated and confirmed in their appointments (Jan. 2, 1940):—Dec. 3, 1939) L. R. Mumby, C. R. Iliffe (substituted for the notifications of Feb. 6, 1940); (Dec. 6, 1939) J. W. Noble (substituted for the notification of Feb. 20, 1940).

The undermentioned Pilot Officers on probation are granted the war substantive rank of Flying Officer on the dates stated and confirmed in their appointments (Aug. 17, 1940):—(April 15, 1940) H. G. Belcher (substituted for notification of Oct. 15, 1940); (April 25, 1940) J. W. Mackay (substituted for notification of Nov. 5, 1940); (July 11, 1940) C. S. Hatfield (substituted for notification of Dec. 3, 1940); (July 24, 1940) A. E. Arnott (substituted for notification of Oct. 8, 1940).

The undermentioned Pilot Officers on probation are confirmed in their appointments (17 Aug. 1940) and granted the war substantive rank of Flying Officer:—(Sept. 1, 1940) C. S. Reade; (Oct. 12, 1940) T. J. da C. Andrade, A. C. Bartrum (substituted for the notification of Oct. 22, 1940).

P/O. on probation G. H. Tebboth is granted the war substantive rank of Flying Officer (Aug. 2, 1940) and confirmed in his appointment (Sept. 23, 1940) (substituted for the notification of Oct. 15, 1940).

The undermentioned Pilot Officers are granted the war substantive rank of Flying Officer:—(Dec. 3, 1939) M. E. L. Hobden (substituted for the notification of April 26, 1940); E. Powers (substituted for the notification of April 30, 1940); H. J. Brass, J. A. C. Maughan (substituted for the notifications of Oct. 8, 1940); (Jan. 20, 1940) J. B. Quarrington (substituted for the notification of June 18, 1940); B. B. Booth (substituted for the notification of Oct. 8, 1940); (March 3, 1940) W. D. Symes, D. H. Wood (substituted for the notifications of April 30, 1940); (March 18, 1940) J. E. T. Murphy (substituted for the notification of April 26, 1940); (April 1, 1940) D. S. E. Gawith (substituted for the notification of May 28, 1940); E. F. Knight (substituted for the notification of Oct. 8, 1940); (April 21, 1940) C. A. Griggs (substituted for the notification of May 28, 1940); (April 24, 1940) F. W. Powell (substituted for the notification of May 28, 1940), J. G. Home, F. E. McDonnell (substituted for the notifications of Oct. 8, 1940); (June 11, 1940) J. H. Francis, G. Steele (substituted for the notifications of Oct. 8, 1940); (June 13, 1940) G. B. Broadway (substituted for the notification of Oct. 8, 1940); (July 1, 1940) C. B. Spaul, H. T. Morgan (substituted for the notifications of Oct. 8, 1940); (July 17, 1940) C. D. Burrill (substituted for the notification of Oct. 8, 1940); (Aug. 23, 1940) O. E. Bartlett (substituted for the notification of Oct. 8, 1940); (Oct. 1, 1940) F. C. Walker (substituted for the notification of Nov. 5, 1940).

Accountant Branch.

The undermentioned are granted commissions for the duration of hostilities as Acting Pilot Officers on probation:—Sergeant: (Dec. 21, 1940) G. J. Hill. Corporal: (Dec. 20, 1940) C. Saunders.

The undermentioned Pilot Officers on probation are granted the war substantive rank of Flying Officer with effect from the dates stated and confirmed in their appointments (April 17, 1940):—(Dec. 6, 1939) R. J. Bray (substituted for the notification of June 18, 1940); (March 3, 1940) R. D. White (substituted for the notification of Aug. 27, 1940).

P/O. D. G. Leader-Williams is granted the war substantive rank of Flying Officer (May 17, 1940) and confirmed in his appointment (June 10, 1940) (substituted for the notification of July 30, 1940).

The undermentioned Pilot Officers on probation are granted the war substantive rank of Flying Officer on the dates stated and confirmed in their appointments (July 29, 1940):—(April 28, 1940) I. I. Watkins (substituted for the notification of Oct. 22, 1940); (June 1, 1940) T. P. Abbott. W. Mackirdy (substituted for the notification of Nov. 12, 1940).

The undermentioned Pilot Officers on probation are confirmed in their appointments (July 29, 1940), and granted the war substantive rank of Flying Officer:—(July 29, 1940) W. C. A. Robinson (substituted for the notification of Oct. 4, 1940); (Aug. 27, 1940) W. G. Morgan (substituted for the notification of Nov. 5, 1940); (Sept. 1, 1940) C. G. T. Lindsay-White (substituted for the notification of Nov. 12, 1940); (Sept. 3, 1940) W. L. Hughes (substituted for the notification of Oct. 22, 1940).

The undermentioned Pilot Officers are granted the war substantive rank of Flying Officer:—(Dec. 6, 1939) R. J. Sharples, R. R. Jack, F. D. Holmes, P. Raby, J. H. C. Russell, S. C. Tapley, H. Bamforth, A. F. Bacon (substituted for the notification of Oct. 8, 1940); (June 11, 1940) L. D. Vickery (substituted for the notification of Oct. 8, 1940).

Medical Branch.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenants:—(Sept. 4, 1940, Sen. Sept. 4, 1939) A. G. Burke, M.B., Ch.B., W. R. Parker, L.R.C.P., L.R.C.S., L.R.F.P.S.

Dental Branch.

Flt. Lt. S. C. Allen, L.D.S., is granted a permanent commission in the substantive rank of Flight Lieutenant (Oct. 13, 1940).

Princess Mary's Royal Air Force Nursing Service

Sister Miss M. A. Boyd resigns her appointment (Jan. 1, 1941).

Royal Air Force Reserve

Reserve of Air Force Officers.

General Duties Branch.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Sept. 9, 1940) E. E. Noddings; (Nov. 13, 1940) J. Boston; (Nov. 30, 1940) T. W. Gillen; (Dec. 16, 1940) A. J. M. Chadwick.

P/O. W. N. Monteith is promoted to the rank of Flying Officer (Nov. 5, 1940).

The undermentioned Flying Officers are granted the war substantive rank of Flight Lieutenant:—(Dec 6, 1939) C. M. Rees; (Dec. 24, 1939) W. A. Rollason; (March 18, 1940) A. D. Page, M.M.; (July 19, 1940) R. H. Niven, D.F.C.; (July 28, 1940) P. E. Grenfell; (August 6, 1940) J. W. Rayner (substituted for notification of Oct. 8, 1940).

Errata.

In notifications of June 4, 1940, concerning F/O. W. L. Thomas and F/O. J. D. Loughnan. *For* May 24, 1940, *read* Sept. 1, 1939.

In notification of Oct. 22, 1940, concerning F/O. J. T. C. Hillman. *For* Oct. 11, 1940, *read* Sept. 1, 1939.

Technical Branch.

The undermentioned Flying Officers are granted the war substantive rank of Flight Lieutenant:—(July 29, 1940) A. C. P. Westhorpe; (Sept. 12, 1940) A. H. A. C. Cranmer; (Oct. 1, 1940) A. Higham; (Nov. 23, 1940) H. M. Samuelson.

P/O. S. W. Rowland is granted the war substantive rank of Flying Officer (March 21, 1940).

Administrative and Special Duties Branch.

P/O. S. W. Fitt is granted the war substantive rank of Flying Officer (Oct. 3, 1940).

Royal Air Force Volunteer Reserve

General Duties Branch.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—(Dec. 16, 1940) M. S. P. Houdret; (Dec. 17, 1940) J. F. Bristow; (Dec. 30, 1940) C. J. Heavysege, F. R. Passmore. Sergeants: (Dec. 6, 1940) G. L. J. Oliver; (Dec. 14, 1940) A. J. W. Froggatt; (Dec. 18, 1940) J. E. Willson; (Dec. 19, 1940) J. S. M. Barkel; (Dec. 19, 1940) C. B. Dove; (Dec. 23, 1940) M. L. H. Carter, G. J. F. Jones, R. E. Lumbery. Leading Aircraftmen: (Oct. 29, 1940) W. Bailey, H. R. G. Jebb; (Nov. 17, 1940) T. R. Hodgson, T. Keightley-Smith, I. K. Parry-Jones, R. L. Roberts; (Nov. 24, 1940) F. E. Holland; (Nov. 30, 1940) E. D. Vivian; (Nov. 30, 1940) C. R. Archibald, D. A. R. Bee, A. E. J. Bourner, P. R. M. Ellison, J. L. Hooper, D. A. Attewell, J. M. Lander, M. P. L. Wall; (Dec. 7, 1940) H. McMichael; (Dec. 14, 1940) J. Bell, J. Buckley, J. K. Edmonds, R. Seely-King, G. F. Wadeson; (Dec. 14, 1940) D. G. Hewlings, L. A. Smith, R. V. D. Smith; (Dec. 21, 1940) A. G. Holdsworth, R. K. Orrock, J. D. Richards; (Dec. 21, 1940) C. D. Loughlin.

Pilot Officer on probation N. R. Dobree is confirmed in his appointment (Oct. 2, 1940).

The undermentioned Pilot Officers on probation are confirmed in their appointments and promotion to the rank of Flying Officer:—(Sept 18, 1940) J. Rush; (Nov. 11, 1940) H. T. Grubb; (Nov. 27, 1940) L. O. Halls, A. L. Pullen; (Dec. 10, 1940) T. A. Freke; (Dec. 17, 1940) J. H. L. Musker, W. S. Thimblethorpe, J. Adair, D. S. Davies, G. E. G. Grindlay; (Dec. 24, 1940) C. C. McCarthy-Jones.

The undermentioned Acting Pilot Officers on probation are graded as Pilot Officers on probation:—(Aug. 25, 1940) W. J. F. McEwen; (Oct. 19, 1940) R. W. J. Hooper; (Dec. 2, 1940) A. J. Picknett; (Dec. 16, 1940) T. V. Welsh.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Sept. 4, 1940) H. L. Cruickshank; (Dec. 13, 1940) F. T. Cragg.

The undermentioned Pilot Officers are promoted to the rank of Flying Officer:—(May 29, 1940) I. H. Grant; (Sept. 29, 1940) J. G. Walker.

F/O. T. H. Clarke is granted the war substantive rank of Flight Lieutenant (Dec. 12, 1939).

The undermentioned Pilot Officers are granted the war substantive rank of Flight Lieutenant:—(Sept. 10, 1940) W. D. Macpherson; (Sept. 24, 1940) L. A. Strange, D.S.O., M.C., D.F.C.

The undermentioned Pilot Officers are granted the war substantive rank of Flying Officer:—(Feb. 6, 1940) J. H. White; (Feb. 15, 1940) M. T. Stephens; (March 2, 1940) J. de la P. R. Preston; (March 19, 1940) P. C. Hoyle; (May 16, 1940) D. S. Wallen; (June 1, 1940) G. A. Worth, M.B.E.; (June 15, 1940) T. V. Mitchell; (July 25, 1940) A. J. R. Downes, R. S. J. Foster; (Aug. 17, 1940) H. Lazelle; (Sept. 15, 1940) T. H. Worth; (Oct. 19, 1940) J. E. M Williams; (Oct. 20, 1940) S. B. Cliff; (Nov. 4, 1940) D. L. Armitage; (Nov. 6, 1940) A. H. C. A. Rawson; (Nov. 22, 1940) H. C. Walters; (Nov. 23, 1940) S. G. E. Spain; (Nov. 30, 1940) W. A. H. Chapman.

The undermentioned are transferred to the Administrative and Special Duties Branch:—Pilot Officer: (Dec. 24, 1940) T. E. S. Norris. Pilot Officers on probation: (Jan. 6, 1941) B. K. Cooper; G. P. S. Pollard.

P/O. H. B. Ainsworth takes rank and precedence as if his appointment as Pilot Officer bore date June 24, 1940. Reduction to take effect from Dec 9, 1940.

Errata.

In notification of Oct. 15, 1940, concerning Sgt. T. C. Prescott. For June 24, 1940, read June 23, 1940.

In notification of Nov. 26, 1940, concerning Sgt. E. A. Scott. For Nov. 16, 1940, read Nov. 15, 1940 (Sen. Nov. 2, 1940).

Technical Branch.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—(Dec. 1, 1940) H. B. Cheese, E. E. Walker.

The undermentioned Pilot Officers on probation are confirmed in their appointments:—(Oct. 4, 1940) H. V. Pexton; (Nov. 4, 1940) S. P. F. Humphreys-Owen; (Nov. 6, 1940) W. J. Reason; (Nov. 9, 1940) F. R. Banks; (Nov. 21, 1940) F. X. J. Armstrong.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer:—(Nov. 4, 1940) C. Pidd; (Nov. 6, 1940) A. E. L. Roylance; (Nov. 13, 1940) C. F. W. Ball; (Nov. 17, 1940) W. R. French; (Nov. 26, 1940) A. E. C. York-Brambia.

The undermentioned Flying Officers are granted the war substantive rank of Flight Lieutenant:—(Dec. 3, 1939) H. B. T. Childs; (Dec. 29, 1939) H. Barker; (March 28, 1940) S. G. Morgan; (July 9, 1940) G. R. Scott-Farnie; (Aug. 6, 1940) D. H. Scott.

The undermentioned Pilot Officers are granted the war substantive rank of Flight Lieutenant:—(July 29, 1940) F. R. Banks; (Aug. 21, 1940) J. N. H. Brooke; (Oct. 13, 1940) C. G. James; (Nov. 21, 1940) T. B. Thomson.

The undermentioned Pilot Officers are granted the war substantive rank of Flying Officer; (Feb 20, 1940) H. J. Barton-Chapple; (April 1, 1940) R. G. Goodfellow; (April 5, 1940) M. G. Scriggs, H. Andrewes, S. F. Evans, A. M. Hardie, R. S. Page, L. W. D. Pittendrigh, E. W. C. Braendle, J. C. Martin, E. M. Eldred, S. P. F. Humphreys-Owen; (April 19, 1940) A. E. Clarke, D.F.M.; (April 23, 1940) F. H. Babcock; (May 1, 1940) F. A. Downes; (May 26, 1940) J. T. Bain; (May 27, 1940) N. Best, J. Ree; (June 6, 1940) J. R. Boundy, F. X. J. Armstrong; (June 10, 1940) R. M. Hayes; (June 13, 1940) A. E. Mitchell; (June 19, 1940) A. E. Dobson; (July 15, 1940) N. Cave, R. F. Durrant, A.F.C.; (July 28, 1940) H. Clarke, E. B. O'H. Bennett; (July 29, 1940) S. Jones, C. J. Bayley, W. Lawson, R. W. Armstrong, C. A. Clark, R. F. Tothill; (Aug. 1, 1940) D. P. Furneaux; (Aug. 12, 1940) F. J. Maggs; (Aug. 16, 1940) G. W. Tookey, P. E. Axon, W. F. Taylor; (Aug. 21, 1940) S. H. White; (Aug. 23, 1940) W. J. P. Sloan; (Sept. 1, 1940) V. Bowman-Burns, J. H. Hunter-Tod, R. D. Racine-Jaques, J. K. Rickard; (Sept. 2, 1940) M. L. D. Metcalfe; (Sept. 9, 1940) R. C. Lawes; (Sept. 21, 1940) E. M. Hook; (Sept. 22, 1940) A. E. W. Ward, E. C. T. Evershed; (Sept. 25, 1940) G. S. F. Barham; (Sept. 26, 1940) G. A. Chapman; (Oct. 3, 1940) N. H. Terry; (Oct. 4, 1940) T. R. White; (Oct. 6, 1940) R. W. H. Bloxam; (Oct. 9, 1940) B. M. J. Davis; (Oct. 10, 1940) P. B. Scott; (Oct. 25, 1940) P. Allden; (Oct. 28, 1940) P. D. Walters, F. W. Everill, V. G. Hopkins; (Oct. 29, 1940) D. R. R. Fair, H. F. Cowin.

Balloon Branch.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—Acting Warrant Officer: (Aug. 13, 1940) E. Kellett. Sergeant: (Dec. 12, 1940) H. H. Turner. Corporals: (Oct. 27, 1940) E. D. Lye, J. H. Wilson; (Nov. 7, 1940) A. J. Sanders; (Dec. 9, 1940) W. McC. Baxter; (Dec. 10, 1940) G. W. Horn. Aircraftsman 1st Class: (Nov. 28, 1940) G. A. Reeves.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer:—(Dec. 1, 1940) G. M. Easten; (Dec. 21, 1940) C. Reffitt.

The undermentioned Pilot Officers are granted the war substantive rank of Flying Officer:—(April 15, 1940) W. M. Prew; June 7, 1940) F. L. M. Harris; (Aug. 1, 1940) W. M. Jack, C. Morris; (Aug. 15, 1940) R. Walker; (Oct. 1, 1940) W. R. H. Robinson; (Oct. 4, 1940) E. C. Crowden, M.C.; Oct. 8, 1940) S. Smith; (Oct. 19, 1940) D. Ross; (Nov. 20, 1940) J. H. King; (Nov. 22, 1940) R. W. B. Chapman; (Nov. 24, 1940) P. K. B. Steadman; (Nov. 26, 1940) J. A. Christie, R. R. Piggott, W. N. C. H. Pitts.

Administrative and Special Duties Branch.

The undermentioned are granted commissions for the duration of histilities as Pilot Officers on probation:—(Aug. 17, 1939) F. C. G. Lord Ackland (substituted for notification of Oct. 3, 1939); (June 29, 1940) M. G. Kidston (substituted for

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notification of Sept. 20, 1940); (July 10, 1940) P. D. Saxton, M.C. (substituted for notification of Oct. 4, 1940); (Oct. 18, 1940) A. W. Miller; (Nov. 8, 1940) A. Bryer-Lloyd, L. Code-Lewis, F. G. Deedes, L. M. G. Foster, B. L. Henderson, C. J. G. Moore, B. M. Rixon, H. McI. Tyndale-Biscoe, P. de Villiers; (Nov. 11, 1940) D. Broad, T. W. Kirkpatrick; (Nov. 12, 1940) W. P. Spooner; (Nov. 15, 1940) S. W. White; (Nov. 18, 1940) F. A. Instone; (Dec. 3, 1940) A. R. Taylor; (Dec. 7, 1940) W. August, D. W. A. Barton, J. S. Batty, J. T. Booth, V. A. P. Bowen, D. Caminer, H. D. Carter, C. S. J. Chapman, J. Durrant, A. L. Dyer, J. F. Ellis, G. W. Farley, A. L. Gashion, H. P. Gibson, G. Hackett, W. G. Hall, A. R. Harris, A. T. Hatton-Smooker, H. C. Hayward, R. E. Histed, G. L. Horsburgh, T. H. Hutchison, R. J. Jackson, G. F. Jarratt, F. D. Kerr, A. M. Knight, R. Knight, W. Lingford, D. Livingston, L. C. Marrow, C. E. Marshall, J. P. McBride, E. C. Metcalf, M. W. Palmer, B. D. Rogers, A. P. Rooke, G. A. E. Ruck, R. A. de B. Saunderson, L. Stockton-Smith, G. Thornber, R. C. E. Waights, J. A. Whittaker, C. W. Wilson, B. A. Wilton, C. B. Wimbury, R. G. Wright, S. W. Yeomans; (Dec. 8, 1940) R. S. D. Simpson; (Dec. 9, 1940) J. E. R. Avery, F. W. Kerr, M.V.O.; (Dec. 10, 1940) A. L. Baker; (Dec. 11, 1940) C. E. Mallam; (Dec. 12, 1940) G. G. M. Biggs, W. W. Bradford, F. F. A. Burden, F. Hodgkin, T. G. Weedon; (Dec. 13, 1940) J. F. Mazdon, W. E. Myhill; (Dec. 16, 1940) H. Pullan; (Dec. 17, 1940) J. H. Sykes; (Dec. 21, 1940) E. W. J. F. Anderson, A. E. Cabeldu, W. H. Catlin, J. G. Chester, R. H. Green, G. H. W. Guest, W. L. V. Harding, S. A. Hogg, K. W. I. Logan, A. S. Mason, C. E. Mason, J. H. P. Paskell, D. A. G. Paterson; (Dec. 23, 1940) C. H. Wood; (Dec. 30, 1940) T. F. Baggaley, A. H. Bishop, G. S. Bright, F. C. Caulfield, G. E. Fisher, F. M. Forster, E. O. Garbutt, F. A. Gibbs, H. Hale, S. Incledon, R. T. Jarman, H. Kaye, T. P. Johnstone, J. G. Leacy, L. Mathews, A. T. Walker, R. O. Watson, G. V. Welbourne, G. McF. White. Sergeants: (Oct. 23, 1940) C. B. Taylor; (Nov. 28, 1940) F. F. E. Yeo-Thomas. Leading Aircraftman: (Oct. 10, 1940) G. T. Annis. Aircraftman 2nd Class: (Dec. 16, 1940) L. A. King.

The undermentioned Pilot Officers on probation are confirmed in their appointments:—(Sept. 5, 1940) H. J. C. Seymour; (Sept. 19, 1940) E. G. Mattingley; (Sept. 26, 1940) W. G. Clarke, H. Dear, R. H. Durman, M. H. Drake, J. J. MacKenzie, F. Samuel; (Oct. 12, 1940) D. A. Davies, D.F.C.; (Oct. 23, 1940) G. Mawer; (Oct. 27, 1940) A. A. D. Sevastopulo; (Oct. 30, 1940) S. T. Hale; (Nov. 10, 1940) A. M. Anderson; (Nov. 13, 1940) C. H. Grey, D.S.O., S. M. Goldsmith; (Nov. 15, 1940) F. L. Roberts; (Nov. 20, 1940) J. B. B. Atherton, J. J. Stuart; (Nov. 27, 1940) E. V. Harrison; (Dec. 6, 1940) R. D. Wright, T. M. Warden; (Dec. 8, 1940) C. C. Wigram; (Dec. 12, 1940) M. Banks; (Dec. 14, 1940) R. K. Morris; (Dec. 20, 1940) D. Roberts; (Dec. 25, 1940) H. J. Upward.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer:—(Sept. 5, 1940) A. B. Tooke, M.B.E.; (Sept. 6, 1940) O. St. J. Swan; (Sept. 19, 1940) J. A. Chubb, T. J. Molony, S. F. Pickup, H. Shackell; (Sept. 26, 1940) A. J. Ansell, G. T. Dunstan, W. S. Featherstonhaugh, E. R. Fell, E. G. Spooner, J. E. T. Sutcliffe, L. G. Jonas; (Nov. 5, 1940) W. D. F. Liston; (Nov. 12, 1940) H. G. Bradshaw; (Nov. 22, 1940) P. G. Clarabut; (Nov. 23, 1940) A. F. Carlton-Scott, E. A. Collis, P. M. Daris; (Dec. 11, 1940) C. P. L. Nicholson, L. D. Stuart; (Dec. 13, 1940) H. A. Thomas; (Dec. 26, 1940) D. C. Beadell; (Dec. 28, 1940) E. J. Barrett; (Dec. 29, 1940) G. F. Orr.

The undermentioned Acting Pilot Officers on probation are graded as Pilot Officers on probation:—(Sept. 13, 1940) L. A. Harvey; (Sept. 27, 1940) E. J. L. Rengert; (Oct. 25, 1940) R. W. S. Nott; (Oct. 29 1940) J. M. Pope; (Nov. 16, 1940) J. E. D'Aeth.

The undermentioned Pilot Officers on probation are promoted to the rank of Flying Officers on probation:—(Sept. 3, 1940) W. F. Allen, E. R. Bles.

The undermentioned Pilot Officers are granted the war substantive rank of Squadron Leader:—(Dec. 9, 1939) D. E. Robertson, O.B., D.S.O.; (Dec. 30, 1939) J. E. Tennant, D.S.O., M.C.; (Mar. 1, 1940) W. C. Wilson, O.B.E., D.S.O., M.C.

The undermentioned Pilot Officers are granted the war substantive rank of Flight Lieutenant:—(Dec. 9, 1939); G. E. Fearon; (Dec. 19, 1939) W. Mac, D.F.C.; (Dec. 22, 1939) W. H. Farrow; (Dec. 28 1939) L. A. E. Edwards, C.M.G.; (Jan. 9, 1940) H. G. Sullivan, D.F.C.; (Jan. 10, 1940) R. H. Humphreys; (Jan. 16, 1940) H. de V. Leigh, D.F.C.; (Jan. 19, 1940) V. R. Hicks; (Jan. 20, 1940) H. A. B. Robb, M.C., A.F.C.; (Jan. 24, 1940) C. O. Powis; (Jan. 27, 1940) R. Tait; (Jan. 30, 1940) L. A. T. Pritchard; (Feb. 5, 1940) L. J. Fletcher; (Feb. 13, 1940) L. A. Nicholls; (Feb. 14, 1940) W. H. N. Shakespeare, M.C. A.F.C.; (Mar. 1, 1940) F. B. Jeffries; (Apr. 2, 1940) W. M. Ackery, D.F.C.; (Apr. 10, 1940) T. G. Whitlock, J. D. Irving, O.B.E., M.C.; (May 28, 1940) L. H. Strain, O.B.E., D.S.C.; (June 4, 1940) A. B. Fanstone, A.F.C.; (June 7, 1940) E. T. Beer; (Aug. 13, 1940) E. W. Husey; (Aug. 19, 1940) F. F. James; (Sept. 26, 1940) P. C. R. Dodd, D.S.O. M.V.O.; (Oct. 1, 1940) E. W. Slade; (Oct. 15, 1940) M. G. de B. Epstein; (Nov. 2, 1940) P. W. Bingham; (Nov. 16, 1940) N. E. Lane.

The undermentioned Pilot Officers are granted the war substantive rank of Flying Officer:—(Dec. 9, 1939) D. A. Adkins; (Dec. 25, 1939) H. B. Bell; (Dec. 28, 1939) H. J. Oughton, P. H. Tremlett; (Dec. 29, 1939) C. W. R. Hodges; (Dec. 30, 1939) C. W. T. MacGillivray, E. F. Briggs; (Jan. 1, 1940) G. B. M. Reed; (Jan. 5, 1940) A. E. Cuthbert; (Jan. 4, 1940) J. H. Mainwaring; (Jan. 5, 1940) C. R. Beaston, E. J. N. Brown, W. P. J. Ovington; (Jan. 6, 1940) J. H. Currie, L. M. Woolveridge; (Jan. 9, 1940) D. Goudie, A. Martin; (Jan. 11, 1940) G. E. Pickton; (Jan. 12, 1940) W. Ronald; (Jan. 13, 1940) C. G. Slade; (Jan. 14, 1940) J. J. B. Rutter; (Jan. 17, 1940) R. J. W. Palmer, T. J. Hudson, H. de G. Domville; (Jan. 18, 1940) T. F. Hudson; (Jan. 19, 1940) F. V. Carpenter; (Jan. 21, 1940) W. F. Willis; (Jan. 22, 1940) E. Brewer; (Jan. 23, 1940) S. J. Wines, J. A. Saward; (Jan. 26, 1940) C. G. Wood, A. E. Loveday, E. R. Playford; (Feb. 1, 1940) F. K. Porte, F. H. N. Gwynne, S. G. Frogley, D.S.O., D.F.C., G. H. L. Easterbrook; (Feb. 6, 1940) F. J. Powell, F. C. Staines, S. R. Stammers; (Feb. 7, 1940) G. L. Chesney, W. C. F. A. Wilson, O.B.E.; (Feb. 8, 1940) W. Woodstock; (Feb. 13, 1940) H. Entwisle; (Feb. 14, 1940) C. H. Mathias; (Feb. 15, 1940) I. W. Parnell, H. J. Spencer, C. H. Beech, F. L. Clark; (Feb. 16, 1940) C. S. Noble, R. H. Tooley; (Feb. 25, 1940) W. C. Dreschfield, J. Duncan; (Mar. 1, 1940) A. C. H. MacLean, C.B.E.; (Mar. 3, 1940) H. G. A. Bitschine, H. A. Buss, O.B.E., D.S.C.; A. H. H. Gilligan, A.F.C., R. D. Stewart, R. L. H. Laye, R. A. Angier, W. P. Stewart, D.S.O., L. C. Mein, R. J. O. Compston, D.S.C., D.F.C.; (Mar. 8, 1940) N. S. Lott; (Mar. 13, 1940) J. L. Trollope; (Mar. 14, 1940) W. W. Scott; (Mar. 18, 1940) J. D. Bowman, R. Barrett; (Mar. 23, 1940) A. S. Graves, A. C. Heyes; (Mar. 29, 1940) S. T. Hosken, A. T. Gammon, O.B.E., R. C. Hedger; (Mar. 30, 1940) E. A. Grant, E. L. Tyes, R. W. Kerr; (Apr. 4, 1940) H. W. Campbell, S. E. Grand; (Apr. 4, 1940) C. C. Hirst, C. E. Holman; (Apr. 6, 1940) F. Garrett; (Apr. 7, 1940) H. Williamson; (Apr. 9, 1940) H. P. Blakeley; (Apr. 10, 1940) A. G. Mower, B. L. Bathurst; (Apr. 11, 1940) A. S. Clark; (Apr. 13, 1940) P. L. Barrow, C. Volk; (Apr. 15, 1940) A. I. Bryson, C. E. Jones, A. F. F. Jacob, D.S.O., E. H. M. O'Farrell, E. V. P. Miller, A. J. Evans, M.C.; (Apr. 17, 1940) H. A. Daniell; (Apr. 18, 1940) J. L. Girling, P. L. Wills; (Apr. 19, 1940) C. Fletcher; (Apr. 21, 1940) F. D. Lloyd, E. G. Gough, R. F. E. Wickham, S. R. Clark; (Apr. 22, 1940) G. G. Braithwaite; (Apr. 25, 1940) N. J. Bengough; (Apr. 28, 1940) S. R. Durdin; (Apr. 30, 1940) C. M. Horsfall; (May 1, 1940) W. H. Jordan, H. Blatherwick, W. H. Gibson, J. S. Hodges, G. Mawer, A. C. Wood; (May 2, 1940) W. E. J. Barry, J. Blackmore; (May 4, 1940) H. F. Shrimpton, A. Miller; (May 6, 1940) F. K. Langton; (May 7, 1940) J. Wilkinson, J. Southall, H. D. Benham, M. J. C. Allom; (May 8, 1940) C. C. Wigram; (May 11, 1940) Lord Auckland; (May 12, 1940) E. E. Stammers; (May 13, 1940) J. C. Richmond, H. E. Craymer, H. Coverdale, W. Morgan-Smith, C. J. Miln, G. M. T. Hogg, D.S.O.; (May 14, 1940) W. D. L. Reyner, M.B.E.; (May 15, 1940) R. G. Brickell, F. C. Honey, J. Wells, M.C.; (May 19, 1940) H. G. Hudson, J. A. M. Faraday; (May 20, 1940) C. E. Turner, R. J. Hulburd, K. S. Innes, C. P. Brady, A. C. Clark, W. S. Cox, A. P. C. Bruce, T. A. S. Harpham, R. S. Spurrier; (May 21, 1940) H. J. C. Seymoor, E. G. Mattingley; (May 22, 1940) W. K. Birch, O.B.E., M. F. Comer; May 24, 1940) A. H. Day, D.F.C., W. T. Smith; (May 25, 1940) A. A. D. Sevastopulo; (May 27, 1940) R. F. S. Irwin, P. C. Cabot, O. W. A. Manning; (May 29, 1940) C. N. B. Crisp, B. W. Kirby; (May 29, 1940) C. A. Narbeth, H. B. Milling; (June 1, 1940) P. R. Bordewich, S. T. Hale, F. F. Howkins, D.S.O., R. W. Dalrymple, W. P. Nicholls, R. Railton, I. MacL. C. Power, J. J. Stuart, S. D. Withers, E. Harle, G. Hobson, R. Bond, C. G. Bloomer, T. Moss, F. W. L. C. Beaumont; (June 2, 1940) K. E. Judd, R. F. Selby, F. W. Mundy, D. W. Carlisle; (June 5, 1940) R. H. Humphries; (June 6, 1940) S. L. Bennett; (June 7, 1940) A. J. Cunningham; (June 10, 1940) A. K. Montague-Beart, (June 11, 1940) D. S. Cumberledge; (June 12, 1940) F. Samuel, P. Fitzpatrick; (June 13, 1940) J. O. Durham, A. G. Harrison, P. M. Brooks; (June 14, 1940) W. J. Gibbs, T. Dootson, L. V. G. Barrow; (June 15, 1940) P. W. Loveday, W. E. Guinness; (June 17, 1940) J. W. Warrington; (June 18, 1940) L. A. Evans; (June 19, 1940) R. J. Bunning, F. Carr, W. E. Windham; (June 20, 1940) W. B. Hammond, W. E. Gemmell; (June 21, 1940) R. G. H. Adams; (June 23, 1940) S. A. Thomson; (June 26, 1940) E. R. Moxey; (June 27, 1940) H. L. Benson, F. A. Dougas; (June 28, 1940) H. P. Flack, D.C.M.; (June 29, 1940) E. R. H. Johnston; (June 30, 1940) H. L. Tudor; (July 1, 1940) E. G. Brant, C. J. Hart, F. Ambler, W. H. B. Reader, H. E. Faulkner, R. W. V. Robins; (July 2, 1940) J. B. Acres, J. E. H. Chadwick, G. N. Snowball; (July 3, 1940) R. T. Raw, W. D. Hall, M.C.; (July 4, 1940) A. C. Bencher; (July 5, 1940) B. I. Beal, W. T. Ganter, W. H. Ashbee, J. K. Grant, O. E. Ward; (July 6, 1940) E. J. Stedman; (July 7, 1940) J. R. S. Borman; (July 8, 1940) S. L. Hooper, C. R. Humphries, C. A. Lewis, R. G. Taylor, R. Winship; (July 9, 1940) B. Steele, W. H. Terry, C. Cornelius-Wheeler, E. L. Ogilvy-Stuart; (July 10, 1940) H. C. T. Browne; (July 12, 1940) H. H. Duckett; (July 13, 1940) H. M. Wilson, F. F. Barrett; (July 15, 1940) S. C. Bacon, C. H. Bizzell, W. G. Peters, A. B. Raymond Barker, C. L. Blake, G. W. Davis, A. E. R. Fitzclarence-Langford, S. D. Harrower, G. B. Atkinson, E. V. Harrison, R. B. Pearce, R. B. Viner; (July 16, 1940) T. R. Skinner; (July 17, 1940) E. Tiddy; (July 18, 1940) R. F. H. Norman, F. W. C. G. Tussaud; (July 20, 1940) H. E. Hinchcliffe, F. R. Hockney, C. C. Cholmondeley, J. Parry, W. K. Young, J. W. Elder, W. Wilson; (July 21, 1940) G. P. Collier; (July 22, 1940) L. C. Lane, J. Blomley, E. P. Thompson; (July 23, 1940) C. P. Andrews; (July 25, 1940) E. L. Fleming, K.C., M.P., R. J. Gammon, D.F.C., C. W. Waitt, M.M.; (July 27, 1940) B. C. McEwen, M.C., L. G. Crawley; (July 29, 1940) H. C. McKinley; (Aug. 1, 1940) A. W. E. Gouries, J. J. Mackenzie, M. Cohen; (Aug. 3, 1940) H. V. Stammers, D.F.C.; (Aug. 5, 1940) D. W. Donaldson; (Aug. 6, 1940) H. A. Chippindale, M.C.; (Aug. 7, 1940) G. C. Lugg; (Aug. 8, 1940) K. G. Withers, C. W. Wright, S. G. Toby; (Aug. 9, 1940) E. A. Eames, H. A. Pound; (Aug. 10, 1940) F. N. Hargreaves; (Aug. 11, 1940) E. Marler, T. W. Pool; (Aug. 13, 1940) F. F. Walter, R. B. Murdoch, T. Davidson, J. E. Carpenter; (Aug. 15, 1940) J. B. Briggs, J. L. Christie, T. P. Aldworth; (Aug. 16, 1940) P. A. F. Belton, B. A. Levey, H. A. D. Currie; (Aug. 17, 1940) R. D. Wright; (Aug. 18, 1940) G. S. Cowan; (Aug. 19, 1940) S. T. L. McLaglen; (Aug. 20, 1940) H. V. Rabagliati; (Aug. 24, 1940) B. E. Lewis, F. F. Tattam, F. J. Wagg, H. J. Upward, V. B. Ronald, R. W. Johnson; (Aug. 27, 1940) W. H. Thomas, M. H. Drake, L. P. Coughlan, C. Walton; (Aug. 28, 1940) S. L. Symondson, G. H. S. Webber; (Aug. 29, 1940) T. T. Warriner, R. B. Rawson; (Aug. 31, 1940) E. R. Pennell, D.F.C.; (Sept. 1, 1940) R. F. Beddow, J. Duncan, F. H. Schofield, H. J. R. Cox, R. Law, W. Berwick, D.C.M., P. A. McEachern; (Sept. 2, 1940) J. D. G. Kellock; (Sept. 4, 1940) C. E. Prescott, H. D. Lay, A. O'Bree; (Sept. 5, 1940) T. H. Seymour, J. P. T. Hall, I. H. Bowhill; (Sept. 6, 1940) J. Exten, L. T. Hill, W. J. Warner, C. F. Cowper; (Sept. 7, 1940) C. G. Gass, M.C., H. R. H. Hylton-Foster; (Sept. 8, 1940) E. Appleby, M.C., M.M.; (Sept. 10, 1940) J. Hogan (substituted for notification of Oct. 4, 1940), G. C. Halley, A. Le B. Johnston, M.C.; (Sept. 11, 1940) H. Wyllie, O.B.E., M. H. Frame, C. J. Millward; (Sept. 12, 1940) the Rt. Hon. Lord Marchamley (substituted for notification of Oct. 4, 1940), W. M. Smith, G. D. F. Keddie; (Sept. 13, 1940) M. C. Radford, D. Maclaren; (Sept. 14, 1940) W. H. G. Leggett, C. B. B. Maturin, E. B. M. A. Duniface; (Sept 15, 1940) J. Parry-Jones, E. J. B. Rose; (Sept. 16, 1940) J. H. L. Dillon-Trenchard; (Sept. 17, 1940) W. S. Dean, L. R. Evershed, G. F. Goddard, E. Drew; (Sept. 18, 1940) R. H. Durnan; (Sept. 19, 1940) M. P. Dalrymple, C. H. Hartley, S. K. Barnes,

EMPIRE PREFERENCE : The recent arrival at a British port of a large draft of R.A.F. personnel trained under the Empire scheme. The output from this scheme has exceeded schedule by over 30 per cent.

SERVICE AVIATION (Continued)

R. E. Le Sueur; (Sept. 20, 1940) L. J. Evans, G. J. Craig, A. A. W. Fowler, R. G. Maclaine, M.C., C. W. Mayhew, M.C., B. A. Taylor, M.B.E.; (Sept. 22, 1940) R. H. Mais; (Sept. 23, 1940) T. A. H. Beddington; (Sept. 24, 1940) A. W. Robinson, V. E. R. Blunt, A. S. Gordon, M.C., J. G. Orange, J. H. Gem; (Sept. 25, 1940) G. W. Delaney, J. J. Boyd-Harvey, S. J. Peskett, Sir R. D. Waterhouse, K.C.B., C.M.G., C.V.O., J. D. Meeke, R. K. Morris, R. J. J. Welcomme; (Sept. 26, 1940) C. D. de Bosdari, H. Perceval, H. R. Herbert; (Sept. 28, 1940) C. A. Hopkins, The Rt. Hon. Lord Cunliffe, R. A. Robertson, B. G. Murphy; (Sept. 29, 1940) H. L. Archibald; (Sept. 30, 1940) A. H. D. Livock, R. W. Money; (Oct. 1, 1940) A. J. M. Ozmond, R. H. Deighton, R. L. Tomlinson, H. F. Payne, T. Bough, J. F. L. Wood, A. A. Crooke, S. Beeby, C. G. P. Kirk, H. C. F. P. Clinton, R. T. Newton, R. C. Cole, E. T. Buller, G. C. V. Fenton; (Oct. 3, 1940) J. Duncan, R. E. Casalis de Pury, A. C. Torry; (Oct. 5, 1940) G. H. Lee, H. N. Aldridge; (Oct. 8, 1940) E. W. Armstrong, F. Gwyther-Jones, T. V. Craig, R. B. Snagge; (Oct. 9, 1940) G. H. M. Miles, J. L. Fowke, L. S. Smith, D. E. Norman, H. C. Cooke, G. N. Sellers, L. H. Mansell, A. S. Radford; (Oct. 10, 1940) G. E. Lovett-Campbell, E. T. Downing, M. J. O'Toole, B. J. Guest, G. V. Cottam, G. P. Burton; (Oct. 11, 1940) J. H. W. Wilcox, J. C. Thompson, G. L. Godden, F. W. Walter; (Oct. 12, 1940) E. M. Summers; (Oct. 13, 1940) W. E. Tollworthy, E. C. Peake; (Oct. 15, 1940) H. S. Newman, D. F. Grierson, M.B.E., A. H. Greatrex, H. W. Cherry; (Oct. 16, 1940) C. S. Pollard; (Oct. 17, 1940) J. Whattam; (Oct. 18, 1940) R. M. C. Day; (Oct. 21, 1940) A. M. Anderson, C. H. Coates; (Oct. 22, 1940) C. H. Grey, D.S.O., T. F. G. Strubell, W. P. Mark-Wardlaw, D.S.O.; (Oct. 23, 1940) W. J. Mitchell, A. C. McKechnie, S. E. Hancox; (Oct. 25, 1940) P. E. Underwood, W. S. Chaney; (Oct. 26, 1940) J. E. A. Barton, W. F. Conway, C. Whitley, M.C., M. T. Wright, E. J. T. Jungius, E. Michelmore, M.C.; (Oct. 27, 1940) C. S. Goodfellow, M.C., H. B. Twissell, R. P. Preedy; (Oct. 28, 1940) C. R. Barke, C.B.E.; (Oct. 29, 1940) R. D. A. Clowes, J. B. R. Ellison, E. H. Stuart, Sir H. W. Hulse, Bart., C. B. Marshall, R. Brocklebank, P. B. H. Home, A. H. W. Wall, A. H. Williams, T. A. C. Burgess, N. A. J. Spencer; (Oct. 30, 1940) P. H. James; (Oct. 31, 1940) E. R. Legh-Jones; (Nov. 1, 1940) O. K. Owen, D. H. Simmons, C. W. Cripps, D.S.O., J. D. K. Lloyd, C. O. R. Mosse, M.C., H. J. Thomas, G. S. Rogers, H. B. Ware, H. F. Fenn, D.S.O.; (Nov. 2, 1940) A. R. Thomson, M.C.; (Nov. 3, 1940) C. F. Cox, J. W. Hogben; (Nov. 5, 1940) S. H. Goldsmith; (Nov. 6, 1940) N. A. Williams; (Nov. 7, 1940) F. M. L. Olsen; (Nov. 8, 1940) B. I. Ward, C. R. L. Fitzgerald, B. W. Noble; (Nov. 9, 1940) L. S. Collard; (Nov. 10, 1940) E. W. Reynolds, H. F. Nicholls, D.F.C., G. G. Kitson, H. Champion de Crespigny; (Nov. 12, 1940) L. W. G. H. W. Waleran, L. I. Eskell, G. M. Fossick, C. Higham; (Nov. 13, 1940) R. T. Foster; (Nov. 14, 1940) H. May, S. D. Antill; (Nov. 16, 1940) A. G. C. Farrar, V. E. A. Isherwood, V. J. Fishley; (Nov. 17, 1940) M. S. Whitehouse, H. M. D. Walker, V. P. Brooks, G. W. Holey; (Nov. 18, 1940) P. K. Robertson; (Nov. 20, 1940) K. B. Harbord, F. J. Ainge, D. L. Howard, M.C., W. T. Morrell; (Nov. 21, 1940) J. T. Histed, C. R. Acton; (Nov. 22, 1940) Sir R. J. F. Chance, Bart., M.C., J. E. Plumridge, D.C.M., H. Walton, P. Edgar, F. Wharton, J. C. McGrath, M.C.; (Nov. 23, 1940) M. H. Thorp, (Nov. 24, 1940) S. G. Gemmell; (Nov. 25, 1940) E. C. F. Ferreira; (Nov. 27, 1940) C. H. W. Frost, A. E. Dennis, W. L. Douglas, N. J. Miller; (Nov. 28, 1940) R. S. P. Boby, T. Capel, M. Goloyine; (Nov. 29, 1940) O. H. Brown, H. Faull, J. L. Rolston; (Nov. 30, 1940) J. H. F. Hoche, W. C. Hart.

The undermentioned are transferred to the General Duties Branch:—Flight Lieutenant: (Aug. 19, 1940) J. S. Hamilton. Pilot Officers: (Oct. 3, 1940) S. Lunt; (Oct. 14, 1940) A. F. P. Fane. Pilot Officer on probation: (Oct. 14, 1940) D. A. Savage.

The undermentioned are transfered to the Technical Branch:—Flight Lieutenant: (April 24, 1940) D. K. Cameron. Pilot Officers on probation: (July 2, 1940) J. N. Walker; (Aug. 19, 1940) H. W. Simpson.

Flt. Lt. C. W. Parker relinquishes his commission on return to the Royal Navy (Jan. 1).

P/O. on probation H. B. H. Hylton-Foster relinquishes his commission on appointment to a commission in the Army (Jan. 6).

P/O. on probation S. Y. Proudfoot relinquishes his commission on account of ill-health (Jan. 11).

F/O. F. P. D. Scott resigns his commission (Jan. 1).

Hon. Flt. Lt. W. E. Wood relinquishes his Honorary commission (Dec. 30, 1940).

The commissions of the undermentioned Pilot Officers on probation are terminated on cessation of duty:—(Nov. 19, 1940) J. T. G. Kingham; (Dec. 10, 1940) R. Perritt.

Erratum.

In notification at Nov. 12, 1940, concerning P/O. on probation L. B. Crouch. *For* Crouch *read* Crough.

Meteorological Branch.

The undermentioned Pilot Officers are granted the war substantive rank of Flying Officer:—(Oct. 1, 1940) S. W. Slaughter; (Oct. 30, 1940) G. J. Evans, H. F. T. Jarvis.

Equipment Branch.

The undermentioned are granted commissions for the duration of hostilities as Acting Pilot Officers on probation:—(Dec. 20, 1940) C. E. B. Baker, W. T. Barnard, N. W. F. Codd, N. J. Donaldson, W. Dowell, D. F. Grant, G. G. Hann, C. D. B. Hawksley, A. T. Hillery, H. L. Hulme, A. R. Jeffery, P. W. Joyce, W. A. Leach-Lewis, F. D. Lynch, D. S. McNeil, D. C. Munro, W. G. Nelson, B. J. O'Reilly, D. A. Porter, P. J. Scott-Allen, K. A. W. Slater, A. McF. M. Stevenson, V. H. Sweeting, C. Taite, M. S. Waghorn. Leading Aircraftmen: (Dec. 6, 1940) H. Gray; (Dec. 6, 1940) J. Fletcher. Aircraftmen 2nd Class: (Dec. 20, 1940) W. R. Collingwood, H. Favish.

The undermentioned Pilot Officers on probation are confirmed in their appointments:—(Sept. 18, 1940) A. S. Duff; (Nov. 9, 1940) B. F. H. Maturin, H. L. Bray.

The undermentioned Pilot Officers on probation are confirmed in their appointments Sept. 18, 1940, and promoted to the rank of Flying Officer: (Nov. 19, 1940) B. E. Goodwin, C. B. Lockerbie, J. F. Sexton.

The undermentioned Acting Pilot Officers on probation are graded as Pilot Officers on probation:—(Sept. 27, 1940) P. L. Hahn, H. Hiley; (Sept. 28, 1940) G. F. Stevens (substituted for the notification of Nov. 5, 1940).

The undermentioned Pilot Officers are granted the war substantive rank of Flying Officer:—(Dec. 3, 1939) E. D. B. Payne (substituted for notification of March 19, 1940), N. R. Melville; (Jan. 13, 1940) W. L. Rees (substituted for notification of June 4, 1940); (Jan. 15, 1940) R. B. Pavey (substituted for notification of March 8, 1940); (Jan. 24, 1940) G. S. de Freitas; (Feb. 8, 1940) M. W. Fuller (substituted for notification of June 18, 1940), E. V. T. Knight, M.B.E.; (March 11, 1940) H. L. E. Julyan (substituted for notification of June 4, 1940), J. Robertson; (April 10, 1940) J. W. E. Sugden; (May 1, 1940) A. B. W. Greenhough; (May 3, 1940) R. Goode; (May 6, 1940) L. F. Weston; (June 11, 1940) R. S. Swanton; (June 16, 1940) K. A. Madin; (July 22, 1940) B. F. H. Maturin; (Aug. 1, 1940) J. M. Barrett, H. Morris; (Aug. 6, 1940) D. I. Farquharson, J. W. Price; (Aug. 21, 1940) G. C. Stonley; (Aug. 25, 1940) M. A. Palethorpe; (Aug. 29, 1940) J. M. Warner; (Sept. 1, 1940) J. C. Forbes; (Sept. 17, 1940) T. C. Hayes-Palmer, R. C. Arendt; (Oct. 1, 1940) A. S. Duff, D. R. Garnham; (Nov. 3, 1940) J. E. Doran-Webb; (Nov. 5, 1940) I. C. Coward; (Nov. 13, 1940) D. T. H. Hooke; (Nov. 15, 1940) J. B. Dixon; (Nov. 22, 1940) N. H. Bennett; (Nov. 28, 1940) I. G. H. Drummond.

F/O. G. E. Clair is transferred to the General Duties Branch (Nov. 1, 1940).

P/O. on probation T. A. Douglas is transferred to the Accountant Branch (Jan. 1).

Accountant Branch.

The undermentioned are granted commissions for the duration of hostilities as Acting Pilot Officers on probation:—(Dec. 2, 1940) P. J. Macduff; (Dec. 14, 1940) W. S. Benwell, W. J. Dawson, L. G. Hancock, J. H. Miller, H. O. S. Morgan, H. P. O'Brian, V. L. Powell, C. V. Priest, D. N. Rabagliati, H. Rapier, D. W. Rollin, J. F. Rowan, F. J. Smith, D. Sturrock, H. E. Wilson, C. F. Winterson; (Dec. 20, 1940) R. A. Aston, F. H. Bach, J. K. Barrow, R. E. Bodey, T. W. Bone, J. Brabin, J. L. Byrne, A. R. G. Cunningham, R. G. S. Darling, L. Goldwyn, J. A. Handyside, I. R. Huntley, L. Johnson, C. A. McCaig, H. B. Reed, F. J. G. Thornton, F. L. Wake, E. L. E. Whitehead. Aircraftman 2nd Class: (Dec. 20, 1940) A. Gray.

The undermentioned Pilot Officers on probation are confirmed in their appointments:—(Oct. 9, 1940) N. Booth, E. G. Fish.

The undermentioned Pilot Officers are confirmed in their appointments Oct. 9, 1940, and promoted to the rank of Flying Officer:—(Nov. 26, 1940) W. Barrow, P. W. M. Hall; (Nov. 30, 1940) R. L. Mansbridge; (Dec. 1, 1940) C. W. Masters, E. D. St. Clair.

The undermentioned Acting Pilot Officers on probation are graded as Pilot Officers on probation:—(Oct. 11, 1940) E. F. Hugen, T. W. Jones, D. McF. Miller, W. L. Williams; (Oct. 31, 1940) J. S. A. Unett.

The undermentioned Pilot Officers are granted the war substantive rank of Flying Officer:—(April 29, 1940) H. J. Binder (substituted for notification of Oct. 22, 1940); (June 30, 1940) A. D. S. Anderson; (Aug. 27, 1940) W. H. B. Carey; (Sept. 1, 1940) J. A. Dyson, A. W. Giles; (Sept. 5, 1940) P. Younger; (Sept. 17, 1940) W. Blair, P. Goldsmith; (Sept. 26, 1940) G. L. Couch, G. H. Briant; (Oct. 1, 1940) C. C. Downing, H. A. Simmonds; (Oct. 5, 1940) C. E. Brown; (Oct. 9, 1940) W. E. Chapman, D. R. Weston, A. W. Bentley; (Oct. 17, 1940) T. G. Blackwell; (Oct. 18, 1940) N. M. W. Harris; (Nov. 1, 1940) E. J. Barnes; (Nov. 4, 1940) N. Booth; (Nov. 15, 1940) J. Sanderson; (Nov. 19, 1940) H. K. Shersby; (Nov. 21, 1940) J. H. Serrell-Cooke.

Temp. Sqn. Ldr. C. J. Chaytor reverts to the rank of Flight Lieutenant at his own request (Jan. 14, 1941).

Medical Branch.

J. P. Griffiths, Ph.Ch., M.D., is granted a commission for the duration of hostilities as Flying Officer (Nov. 26, 1940).

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Nov. 15, (1940) D. Wilson, M.B., B.S., M.R.C.S., L.R.C.P.; (Nov. 21, 1940) D. St. C. L. Henderson, M.B., Ch.B.; (Nov. 28, 1940) B. B. Botha, M.R.C.S., L.R.C.P.

Errata.

In notification of Dec. 20, 1940, concerning J. L. Trent, M.R.C.S., L.R.C.P., and J. G. M. McMurchy, M.D., M.C.P. & S. *For* Pilot Officers *read* Flying Officers.

In notification of Dec. 31, 1940, concerning W. Poskett, M.C., M.D., B.S. *For* Poskett *read* Foskett.

Chaplains Branch.

The undermentioned are granted commissions for the duration of hostilities with the relative rank of Squadron Leader:—(Dec. 10, 1940) The Rev. H. Richardson, The Rev. F. A. Sadler, M.A.; (Dec. 17, 1940) The Rev. J. Gill, B.A., The Rev. C. R. Goulding; (Dec. 20, 1940) The Rev. E. J. W. Sass, The Rev. W. J. P. Shirehampton, M.A.; (Jan. 1, 1941) The Rev. J. L. Gammon, The Rev. A. E. McCaig, M.A., The Rev. F. T. Maydew.

Auxiliary Air Force

General Duties Branch.

P/O. A. R. Gillespie is promoted to the rank of Flying Officer (Sept. 8, 1940).

The undermentioned Flying Officers are granted the war substantive rank of Flight Lieutenant:—(Dec. 13, 1939) C. R. Pritchard; (April 25, 1940) F. K. Stead.

Flt. Lt. E. S. Williams is transferred to the Administrative and Special Duties Branch (Jan. 4, 1941).

Flt. Lt. W. A. Brown takes rank and precedence as if his appointment as Flight Lieutenant bore date Dec. 3, 1940. Reduction to take effect from Dec. 9, 1940.

Balloon Branch.

The undermentioned Pilot Officers are granted the war substantive rank of Flying Officer:—(Dec. 6, 1939) A. H. Hastings, O. S. Holman, H. F. Fulford, H. T. Rees, G. H. Hitchings, W. B. Bush, G. M. Palmer, Q. O. Sansbury, W. G. H. Hedges, H. L. Jarman, T. J. Davies, W. L. Chapman; (Dec. 7, 1939) S. D. Dickson, R. G. A. Colley; (Dec. 8, 1939) A. L. Baker, G. R. Andrew; (Dec. 9, 1939) S. G. Pike; (Dec. 10, 1939) H. E. Macdonald; (Dec. 28, 1939) W. L. Chapman; (Dec. 29, 1939) G. R. Andrews; (Feb. 3, 1940) E. H. Stewart; (Feb. 10, 1940) K. G. Marsh; (Feb. 11, 1940) J. Robertson; (Feb. 18, 1940) J. K. Rodger; (March 1, 1940) H. Copley, K.C.M. Stock; (March 6, 1940) F. O'Brien; (April 1, 1940) J. N. Browne, G. Smith; (April 3, 1940) A. F. B. Ham; (April 15, 1940) S. T. Carter, N. S. Todd, J. S. Steven, G. S. Pollock, M.B.E., W. D. Brotchie; (April 19, 1940) J. N. Cuss; (May 3, 1940) H. D. Thompson, M.C., J. A. Ottignon; (May 14, 1940) J. H. D. Marshall; (June 1, 1940) S. L. Kilburn, G. A. Wright; (June 4, 1940) H. C. Radcliffe; (June 8, 1940) J. B. Copley; (June 9, 1940) T. Barclay; (June 15, 1940) F. D. C. Taylor; (June 19, 1940) S. G. Mackley; (June 20, 1940) C. F. Pennell; (June 30, 1940) D. A. Lamb, W. J. Bond; (July 1, 1940) H. E. Grove, V. A. J. D. Lomax; (July 2, 1940) C. K. Horne; (July 3, 1940) J. L. Addleshaw; (Aug. 2, 1940) N. E. Fawcett; (Aug. 5, 1940) H. A. V. Gibb; (Aug. 15, 1940) C. E. Worthington; (Aug. 18, 1940) E. S. Brown; (Aug. 20, 1940) H. G. Bird; (Aug. 24, 1940) H. G. Webster; (Aug. 25, 1940) H. G. Lunt; (Aug. 27, 1940) E. Garland; (Sept. 1, 1940) A. Vernon, P. E. R. Levy; (Sept. 17, 1940) P. J. Mesedaile; (Sept. 21, 1940) J. Bailey; (Nov. 1, 1940) E. H. King, R. B. Hawkes.

F/O. J. A. Banwell is transferred to the Administrative and Special Duties Branch (Jan. 1, 1941).

Accountant Branch.

P/O. P. Nuttall is granted the war substantive rank of Flying Officer (Aug. 13, 1940).

Auxiliary Air Force Reserve of Officers

General Duties Branch.

The undermentioned Flying Officers are granted the war substantive rank of Flight Lieutenants:—(March 19, 1940) P. J. Clive; (April 30, 1940) G. H. Compton; (Aug. 9, 1940) R. F. G. Lea.

The notification of Dec. 3, 1940, concerning F/O. P. B. Robinson is cancelled.

Women's Auxiliary Air Force

The undermentioned are appointed Assistant Section Officers:—(Jan. 1, 1941) A/CW.2 Miss L. M. Brigstocke, Sen. Sgt. Mrs. L. M. Bryan, A/CW.1 Miss H. A. Burriss, Sgt. Miss P. H. Hanford, A/CW.1 Miss P. A. Hickling, Sgt. Mrs. M. E. Kent, A/CW.2 Miss A. McW. McCurrach, A/CW.1 Miss B. May, Cpl. Miss R. F. C. Morrogh-Stewart, A/CW.2 Miss L. Trengrouse; (Jan. 2, 1941) A/CW.1 Miss G. O'Leary, A/CW.1 Mrs. A. T. Owens, A/CW.1 Mrs. A. Sissons, A/CW.1 Miss R. M. Turnley; (Jan. 4, 1941) A/CW.1 Miss F. F. G. Bird, Cpl. Miss K. R. Blaylock, A/CW.2 Miss M. I. Cooper, Cpl. Miss E. Cross Brown, A/CW.2 Miss E. F. Fyfe, A/CW.2 Miss H. D. G. Goode, A/CW.2 Miss P. R. Green, Cpl. Miss M. M. Hanrahan, A/CW.1 Miss O. M. Hutchison, A/CW.1 Miss B. L. F. Noel, A/CW.1 Miss M. B. Norwood, A/CW.1 Miss J. P. Plunkett, A/CW.2 Miss M. C. Voisey.

The undermentioned Assistant Section Officers relinquish their appointments:—(Nov. 30, 1940) Miss J. M. Tapsfield; (Dec. 29, 1940) Miss R. H. M. Gurdon; (Jan. 9, 1941) Mrs. K. A. Livingston.

Erratum.

In notification of Jan 3, 1941, concerning A/CW.2 Miss J. MacCalman. *For* Miss J. MacCalman *read* Mrs. J. Baird.

AIR STRATEGY (Continued)

authority. The German air tactics in the Battle for France were based on superior numbers, surprise in methods of attack and swiftness in changes of tactics to meet developing situations.

All of these considerations appear to point to one fact, that the *Luftwaffe* must have been expressly built and equipped and its personnel trained over a long period for the type of war which it sprang on Europe in the spring of 1940. From this we may reasonably deduce that it has been remodelled and retrained for the offensive which will be required of it in the spring of 1941.

(Next week: Attack Against Britain.)

AVOIDING WASTE

Increased Use of Aluminium Alloy Scrap for Aircraft Materials Marks an Important Stage in Light Alloy Industry

By H. F. JAMES (Director of the Northern Aluminium Company, Limited)

As a result of the urgent need for still further increasing the output of British aircraft, the most efficient utilisation of all available supplies of aluminium is now a matter of the greatest importance. The most remunerative step in this direction is to ensure that all good quality aluminium alloy scrap is recovered in an identifiable form for further use.

The magnitude of the quantities likely to become available can best be indicated by the fact that for every 100 tons of light alloy materials supplied for airframe and engine production not more than 25 to 30 tons flies away in the completed aircraft.

Several British Standard Specifications relating to aluminium alloy products for aircraft construction have recently been relaxed in order to permit the use of scrap other than that of a manufacturer's own production. These modifications mark an important stage in the history of aluminium alloy manufacture, in that their introduction removed the sole remaining dividing line between the so-called "virgin" and "secondary" alloys.

For some years this division has been somewhat fallacious except in the case of materials required to conform rigidly to British Standard Specifications. The increasing care taken in the segregation and remelting of light alloy scrap has permitted the introduction of much larger proportions of such scrap into good-quality alloys. There are now no high-quality aircraft alloys in which scrap is not or cannot be used.

There is no doubt that, so long as unwanted constituents in scrap are kept within the required limits by careful sorting and melting in clean furnaces under satisfactory conditions, the product is in all respects suitable for addition to melts consisting of virgin metal and production scrap from semi-finished forms such as, for example, aluminium alloy sheets.

Before the war, scrap from specification materials in the form of sheet cuttings, forging trimmings, turnings, etc., was chiefly used in the manufacture of certain relatively low-grade casting alloys from which many of the light alloy castings employed in the motor trade were produced. Thus, before the previously mentioned modifications to specifications were introduced a danger existed that the practice might continue of degrading high-quality scrap such as duralumin sheet cuttings by adding it to melts containing zinc, iron, silicon, or other impurities in order to produce low-grade casting alloys. This would, of course, have resulted in a loss of aluminium for aircraft production of several thousand tons a year.

Immediately upon the outbreak of war, however, the use of aluminium was necessarily very severely curtailed, and it became obvious that all good quality scrap should be segregated and used again in melts of composition similar to that of the original sheet, rod or other material from which it was produced. Utilised in this manner its intrinsic value is approximately equivalent to that of alloys of similar constitution produced from virgin materials. The percentage of such secondary material that can be added to melts is limited only by the supplies of segregated scrap available and not, as has been the case hitherto, by the quantity of impurities allowed to mix with the scrap.

It is important that every ton of good quality scrap, conserved by careful sorting and melting, saves a ton of imported virgin metal and the shipping space required to transport it to this country.

Curtiss-Wright Transport

TEST flights with the Curtiss-Wright Transport, formerly known as the CW-20, have been resumed at St. Louis after some structural alterations. The tests were witnessed by airline and Government representatives, and it is reported by *American Aviation* that the Army Air Corps has selected the airliner as a basic design for a new troop transport and cargo carrier. A full description of the Curtiss-Wright was given in *Flight* for January 11, 1940, page 28.

Dr. Hele-Shaw

WITH the death, on January 30, at the age of eighty-six, of Dr. H. S. Hele-Shaw, Great Britain has lost a scientist of high standing and a most prolific inventor and designer. Henry Selby Hele-Shaw was born at Billericay, in Essex, and at the age of twenty-seven he became the first professor of engineering in University College, Bristol. In 1885 he was chosen for the Harrison Chair of Engineering at Liverpool University. After that he held important posts in South Africa.

In later years the number of inventions which bore his name became almost legion. So far as British aviation is concerned, the contribution for which he will ever be remembered is the variable-pitch airscrew. In collaboration with one of his assistants he introduced the Beacham-Hele-Shaw hydraulic pitch-control hub. His lecture on the subject at the Royal Aeronautical Society will still be remembered. It was given at a time when neither Air Ministry technicians nor the majority of aircraft designers considered the variable-pitch airscrew worth while. They were quite right—at the time. The speed range of aircraft in those days was not great enough to justify the weight, expense, and complication. But Hele-Shaw looked ahead and foresaw that the day would come when the variable-pitch airscrew would be a necessity.

It must ever be to the credit of the Gloster Aircraft Co., Ltd., that they appreciated the value of this invention and took it up for further development. Still more recently the work has been continued and carried forward by Rotol Airscrews, Ltd. On his death do not let us forget what we owe to the genius of Dr. Hele-Shaw.

Fibre Glass Material

TAYLORCRAFT and Piper Cubs are now using a fabric made of "fibre glass" for wing covering. This has been developed by the Owens Corning Fibreglass Corporation and, in the tape form, the material is also being used to bind fuel pipelines made of Neoprene, the du Pont synthetic rubber, so providing them with the necessary strength to withstand high pressures. "Fibre glass" is non-inflammable and is said to have a high tensile strength.

THE CHANCES OF INVASION

Prospects of Air-borne Troops : Key Position of Fighters

By MAJOR F. A. de V. ROBERTSON, V.D.

THE authorities have been warning us that the danger of an invasion is not over, and that we must all be on the *qui vive* to meet it and deal with it, if and when it comes. The Germans have been saying that the war is to be won by defeating Great Britain and in no other way, and at no other place. That is one way of comforting Mussolini, for it implies that British victories in the Middle East and round the Mediterranean will be of no account if Great Britain herself is to be mastered by German arms. The argument is specious, but not entirely conclusive. One may recall how M. Reynaud wished France to fight on in her colonial Empire after the homeland had been beaten by the German invaders. Marshal Pétain's periodic resistance to German pressure is based on the unspoken threat that, if pushed too hard, the Vichy Government might even yet withdraw to Algeria and Tunisia with the remains of its fleet, and there take up a new attitude beyond the reach of a Power which has no means of crossing the sea. Our own Prime Minister, too, when the tide of war was not running too favourably for us, threw out a hint that if the need arose the British struggle against dictatorship would be continued in and from the British Empire. Further, the Government has given an assurance to the United States that, however badly the United Kingdom might be defeated, the Navy would in no circumstances be handed over to the Germans. So that even if Hitler were to lord it at St. James's (perish the thought!) free Britons, no doubt with the full power of the United States at their side, would still fight on in the cause of liberty.

Hitler's Promise

There is a chance that the German talk of an invasion of Britain may be a feint, designed to prevent us from sending more reinforcements to the Mediterranean theatre of war; or, on the other hand, the massing of German troops on the frontiers of Yugoslavia and Bulgaria may be intended to make us think that the real German threat is to the Suez Canal. The enemy will undoubtedly want to keep us guessing as to his next move. It is, however, significant that a sort of promise to invade Great Britain has been broadcast to the German people. The propaganda machine in Germany is in such order that the people at home there can be kept ignorant of or informed about any particular thing which the Nazi party wishes them to know or not to know. Announcements made to the German people may have more behind them than broadcasts which are meant mainly for foreign ears. If Hitler promises something to his own people and fails to make his words good, he will lose some of the prestige which still surrounds his name at home. Therefore this promise to invade Great Britain may have more substance in it than can be found in some other German declarations.

One thing is certain. Germany has not the naval power to attempt to win command of the seas and then land her troops on this island with comparative ease. If the invasion is attempted it will have to be by trying to evade the Royal Navy. It must be difficult for our ships to watch every area of the seas between our coasts and those of Europe, for the hostile shores of the Continent now extend from Norway to the Bay of Biscay. We sorely miss the help of the French Navy; though the fifty American destroyers which have been made over to us are a great help. The Coastal Command aircraft, too, are giving invaluable help in watching all the possible invasion ports. But foggy weather will blind the ships and will still more effectually close the eyes of the scouting aircraft. There was a chance that the attempt might be made during the winter when conditions were right. Right conditions imply low visibility and a calm sea. Presumably the sea would have to be calm on all sides from which the invading ships would have to start.

Conditions which were right for the German transports would not necessarily meet the whole case. The *Luftwaffe* would have to play its part. Severe bombing attacks on the British land forces opposite the selected landing places would probably be thought quite necessary, and there is also the possibility of the use of air-borne troops. If fog lay over this island it might be well out of the question for the German aircraft to play their allotted part in the invasion. At any rate, most of the winter has now gone without a move by the invading forces They may still make the attempt before February is out, or they may wait for the very different conditions which obtain in the spring. When so many favourable circumstances in different parts of Europe have to coincide, and as weather is very unaccountable—especially when the Germans only receive partial weather reports—it becomes obvious that extremely careful organisation would be necessary to seize a moment which was in all respects favourable and launch the attack from its various starting points. Meticulous care in organisation is one of the strong points of the German character, though the organisation is apt to be cumbrous and slow, and speed in seizing an opportunity is not such a strong national characteristic.

The Prime Minister has reminded us that we are still a half-armed nation, though we are now infinitely better off than we were on the morrow of the rescue from Dunkerque. Modern war is an affair of machines, and in land fighting that means, not only machine guns and machine-gun-carriers, but tanks of various categories, guns of various calibres, and motor transport. Vast masses of men with rifles do not count now as they did in the last war. Manpower only counts relatively to the numbers of machines available. The British Army has now enough machines at its command to set a problem for any invading force. Invaders cannot overwhelm that Army if they have no arms but machine guns and a limited number of machine-gun-carriers. They would certainly need heavy ordnance and tanks, and these could only be transported by sea. If the vessels which brought them eluded the Royal Navy, the guns and tanks could not be landed until a safe landing place on shore had been prepared for them.

Landing the Aircraft

These considerations point to a surprise coup by air-borne troops who would be ordered to seize and hold suitable stretches of the shore until the heavy armament could be landed and got into action. The *modus operandi* might well resemble that used in the invasion of Holland. First would come swarms of aircraft which would drop large numbers of specially trained parachute soldiers at various selected points. It would be very necessary to attack simultaneously and at a number of widely separated points, so as to confuse the British reserves. The descent of the parachutists would probably be made at dawn. It would be the task of these men to overpower the Home Guard on the spot with all speed, and then to prepare, likewise with all speed, a landing ground for troop-carrying aircraft by removing obstructions. It would not need to be a very smooth landing ground, for the object of the troop-carriers would be to get the soldiers down in fighting condition, regardless of whether the aircraft would ever be fit to fly again or not. If the machines had retractile undercarriages (which the Ju 52 has not) the landings might be made with wheels up, except where the parachutists had seized an aerodrome. They would not be likely to seize many. The descent would be made some distance inland, and the troops would assail the defenders of the beaches from the rear.

During the fight to secure spots on the beaches for the disembarkation of the heavy ordnance, the British defenders would be heavily assailed from the air with every weapon and device which the *Luftwaffe* could muster. It